Long-term Changes in Abundance-Occupancy Relationships and Trembling Aspen Cover and Density with Prescribed Burning in the Fescue Grasslands of Prince Albert National Park

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Abstract

Loss of Plains Rough Fescue (*Festuca hallii* (Vasey) Piper) Grassland to woody species encroachment is a significant conservation concern that threatens remaining Fescue Prairie. Outlying patches of Fescue Prairie exist among predominantly trembling aspen (*Populus tremuloides* Michx.) forest in Prince Albert National Park (PANP), Saskatchewan. These Fescue Grassland patches have shrunk considerably over time through periods of fire suppression and prescribed burning; however, the effects of different season, number, and time since burning treatments used to control trembling aspen encroachment in the Fescue Grasslands of PANP have not been studied. The overall objective of this research was to determine if succession after burning shapes the relationship between the density and distribution of species (abundance-occupancy relationship) within and between plant communities, and to determine if prescribed burning is effective in controlling trembling aspen encroachment in the Fescue Grasslands of PANP. The relationship between species abundance and occupancy, and the density and cover of trembling aspen in grassland and forest transition (ecotone between Fescue Grassland and forest where trembling aspen encroachment was evident) plant communities was assessed using a 35-year dataset collected in PANP. Abundance-occupancy relationships with varying time since burning were examined to determine if they changed through time. Relationships between trembling aspen density and cover with varying season, number of burns, and years after burning were examined to determine if trembling aspen encroachment was suppressed with the prescribed burning. An increase in species abundance relative to occupancy was observed in 1983 and in 2010 in the grassland community, while abundance-occupancy relationships in the forest transition community did not change through time. Variability in abundance-occupancy relationships within and between plant communities suggests succession may play a role in shaping abundance-occupancy relationships. None of the burn treatments were effective in controlling trembling aspen; rather they promoted increased density through vegetative reproduction. Trembling aspen density increased after burning, and was likely caused by consumption of aboveground structures, removing apical dominance that stimulates intense vegetive suckering. Through time, the high density of trembling aspen suckers that initiated after

burning likely self-thinned as cover increased. Spring burning increased density of trembling aspen more than fall burning; however, trembling aspen cover was greater with fall burning than spring burning over time. Cover of trembling aspen increased through time in both the grassland and forest transition communities, and was greater with more burns in the forest-transition community. It appears the forest transition and grassland communities in the Fescue Grasslands of PANP have changed considerably over time, and require prompt management adjustments if trembling aspen encroachment and loss of Fescue Grassland is to be controlled. Prescribed burning for the conservation of these Fescue Grasslands is ideal, but should not be practiced in isolation without secondary control of trembling aspen suckering. Modeling management practices from historic grazing and fire interactions may improve the control of trembling aspen encroachment in the Fescue Grasslands of PANP.

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1.0 General introduction

1.1 Background

Fire provides heterogeneous habitat that encourages increased species diversity and promotes important grazing interactions in the Fescue Prairie Association. Patches of Fescue Prairie are hereafter referred to as Fescue Prairie, and as Fescue Grassland or grasslands when considering plains rough fescue (*Festuca hallii* (Vasey) Piper) dominated plant communities within the Fescue Prairie (Bailey and Anderson, 1978; Campbell et al., 1994; Romo, 2003). Modification of the disturbance regime in the Fescue Prairie can alter plant community composition and structure (Bailey and Wroe, 1974; Romo, 2003). Fire suppression is a common example of such modification, where the transition between open grassland and forest may favour encroachment of woody species such as trembling aspen (*Populus tremuloides* Michx.) (Maini, 1960; Fraser et al., 2002). As plant communities change over time, abundance-occupancy relationships (AORs), the density of species and their distribution over the landscape, may also change. Mechanisms that drive AORs are not fully understood, and may be shaped by multiple mechanisms acting within and between plant communities (Borregaard and Rahbek, 2010; Buckley and Freckleton, 2010). How succession effects AORs through time has not been studied, despite firm knowledge and support for the role disturbance plays in restructuring plant communities (White, 1979). Prescribed burning has been used to control trembling aspen encroachment in the Fescue Grasslands of Prince Albert National Park (PANP); however the effectiveness of prescribed burn treatments in controlling trembling aspen encroachment, and change in plant community AORs after burning have not been evaluated.

In this thesis plant community changes with time since burning are examined using data from a 35-year prescribed burn study conducted within the Fescue Grasslands of Prince Albert National Park, Saskatchewan. The overall objectives of this thesis are to determine if succession shapes AORs within and between plant communities, and to determine if prescribed burning was effective in controlling trembling aspen encroachment in the Fescue Grasslands of PANP. In Chapter 2, a brief literature review of the history of Fescue Prairie, fire and grazing interactions and effects of fire on trembling aspen is presented. Detailed study objectives, design, data

collection and handling, and a descriptive analysis of the plant communities are then provided. In the Chapter 3, changes in AORs within and between grassland and grassland-forest transition communities with time since prescribed burning are shown. In Chapter 4, changes in trembling aspen density and cover with time since prescribed burning are shown, indicating encroachment of Fescue Grassland has occurred. The general conclusions in Chapter 5 highlight the outcomes of this research, and discuss possible management implications to the Fescue Grasslands in PANP.

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Chapter 2 preamble

This chapter provides detailed site and plant community descriptions for the Fescue Grasslands included in the prescribed burn study in Prince Albert National Park. These descriptions are intended to aid in the interpretation of studies included in the following chapters. The plant community descriptions that are presented highlight important trends that were accounted for in analyses of the following data chapters.

2.0 Site history and descriptive analysis of plant communities of the prescribed burn study in Prince Albert National Park

2.1 Abstract

Important differences in plant community structure occur in and around the Fescue Grasslands of Prince Albert National Park. Areas of Fescue Grassland that were used as study sites for the prescribed burn study 1975-2010 differed considerably; Wasstrom's Flats was characterized by species indicative of grassland, while Sugar Creek was better defined by shrubby species and tall forbs, and Rabbit Creek by weedy species. As such, bias introduced by combining data from these grasslands was considered in further statistical analyses. Control plots receiving no burn treatment also had unique species composition, suggesting they be removed from further statistical analyses. Successional vectors of plots in the grassland and adjacent forest transition plant communities indicated plots generally move in unison through time since burning.

2.2 Introduction

2.2.1 History of Fescue Prairie; modification and current conservation risks

The Fescue Prairie is a unique temperate grassland association that historically dominated the northern edge of the Great Plains (Coupland and Brayshaw, 1953; Coupland, 1961; Looman, 1969). The Fescue Prairie is relied upon as a source of forage for livestock, recreation, and provides valuable habitat for wildlife (Burkinshaw and Bork, 2009). The rich soils that supported the historic Fescue Prairie now mostly support arable agriculture. Wide spread conversion to cropland during the settlement period destroyed of most of the Fescue Prairie, and ongoing degradation from cultivation, overgrazing, exotic species invasion and woody species encroachment persists (Gerry and Anderson, 2002). Natural disturbances regimes of the Fescue Prairie have also been severely modified, further threatening the Fescue Prairie remnants (Cameron, 1975; Trottier, 1985). Ongoing development and protection of infrastructure and

forage has led to the suppression of fire beyond the historic return interval. Aside from fire suppression and landscape modification changing how plant communities may respond to natural fires, lack of fire allows woody species encroachment in many remaining Fescue Prairie patches.

Threats to remnant Fescue Prairie are of immediate relevance given ongoing concern for Fescue Prairie. Plains rough fescue (*Festuca hallii* (Vasey) Piper) has recently been suggested as a candidate to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to seek protection under the Species at Risk Act (SARA) (COSEWIC, 2011; C. Neufeld, personal communication.). The intent of SARA is to prevent species in Canada from becoming at risk and to provide for their recovery (COSEWIC, 2011). Although listing under SARA is reserved for individual species, the listing of plains rough fescue would offer protection for the Fescue Prairie habitat in which it occurs. This recent attention reflects the widespread concern and need for increased knowledge of the current state of Fescue Prairie, a better understanding of the present risks to it, and increased conservation efforts. With few remaining representative patches of Fescue Prairie, it is important to understand how these communities change through time with the reintroduction of fire.

Remnants of Fescue Prairie occur within Prince Albert National Park (PANP), and have been subjected to relatively little anthropogenic modification. The fire return interval, however, has been considerably altered since park formation, and woody species encroachment has occurred (Parks Canada, 2011). Fescue Grasslands in PANP continue to shrink as a result of encroachment, threatening species diversity of the grasslands and potentially the grassland community itself. Like the greater Fescue Prairie, information on how these Fescue Grasslands change though time is needed to better guide their management.

2.2.2 Fire and grazing interactions

Fire and grazing played a large historical role in the functioning, composition and structure of the Fescue Prairie (Anderson and Bailey, 1980; Campbell et al., 1994; Romo, 2003). Heterogeneity introduced by burning and grazing ensured a diverse array of habitat requirements supporting a variety of species. The natural fire return interval in the Fescue Prairie is variable, ranging anywhere from one to 60 years (Romo, 2003). Direct effects of fire in a grassland system partially or entirely destroy aboveground plant structures. As such, indirect alterations to soil resources such as modified light intensity, soil water content, nutrients and temperature may

occur after fire. Variability in these resources, interacting influences of climate, and the frequency which fire recurs create variability in plant communities. The fire regime is regulated by forces of ignition such as lightning strikes or anthropogenic origin, and accumulations of plant matter. Accumulation of litter after fire is also altered by effects from grazing (Fuhlendorf and Engle, 2001). Historically, grazing animals such as plains bison (*Bison bison bison* L.) and elk (*Cervus elaphus* L.) followed fires, consuming young palatable regrowth (Fuhlendorf et al. 2009). The increased traffic in areas recently burned leads to trampling or consumption of regenerating woody species such as trembling aspen (*Populus tremuloides* Michx.). As grazing pressure was reduced with time since burning, amounts of litter increased and accumulated through time. Therefore, fire return intervals were likely a function of sources of ignition, amounts of litter, grazing, as well as environmental and climatic conditions (Wilson, 1998; Romo, 2003). With large scale anthropogenic modification of the Fescue Prairie, the intertwined relationships between fire and grazing disturbance regimes have been altered. The remaining Fescue Prairie is fragmented, and large-scale, naturally occurring fires as part of the historic regime no longer occur. In addition, keystone species such as plains bison have been almost entirely removed from the system. The ability of Fescue Prairie to perpetuate as it would under natural disturbances is likely compromised, and has unknown consequences for the long-term function, structure and composition of Fescue Grassland. To re-introduce fire and grazing on a scale representative of natural processes is likely not achievable. However, prescribed burning can be used to restore remaining Fescue Prairie (Bailey and Wroe, 1974; Gunn et al., 1976; Bailey and Anderson, 1978; Trottier, 1985; Gross and Romo, 2010).

Prescribed burning alone as a management tool disregards important interactions between grazing and fire. Burning alone may lead the Fescue Prairie system down a predictable successional path divergent from historical patterns. Fire stimulates growth of woody species such as trembling aspen, with which Fescue Grassland often co-occurs (Coupland and Brayshaw, 1953; Maini, 1960; Coupland 1961; Looman 1969). Fire removes aboveground structures causing loss of apical dominance with the reduction in auxin production in apical buds and tissues (Maini, 1960; Fraser et al., 2002). With this release, cytokinin produced in the roots stimulates sucker development, increasing density and cover of trembling aspen (Frey et al., 2003). Without grazing or other control of suckering after fire, encroachment of grasslands by

woody species is a serious threat in the Fescue Prairie (Bailey and Wroe 1974; Anderson and Bailey 1990; Bailey et al. 1990).

Prince Albert National Park provides a unique area to study these processes. A free-ranging herd of plains bison utilizes areas within and outside of the park. Patches of Fescue Grassland exist in the southern portion of the park amidst trembling aspen-dominated forest. These patches of Fescue Grassland, however, have shrunk considerably over time. In effort to push back grassland-forest boundaries, a prescribed burn study was implemented in 1975 to test the effectiveness of different seasons and number of burns in controlling trembling aspen encroachment. Although the main herd of plains bison does not frequently utilize the Fescue Grasslands used in this study, the key grazing and fire components of the Fescue Prairie disturbance regime exist in the park. Regaining connectivity between burning and grazing would greatly improve the management and ultimately composition, structure and functioning of these Fescue Grasslands. To facilitate this reconnection would be an accomplishment towards improved management of remnant Fescue Prairies.

The objectives of this study were to assess long-term changes in plant community structure in the Fescue Grasslands of PANP over time since burning, and to assess risks from trembling aspen encroachment associated with these changes. Specifically, the relationship between abundance and occupancy of species in Fescue Grassland and forest transition plant communities was first assessed to determine how these patterns changed since burning. The forest transition plant community included ecotonal areas between grassland and forest where trembling aspen encroachment was evident in 1975. Secondly, change in the density and cover of trembling aspen since different prescribed burn treatments were used to examine trembling aspen encroachment, and to assess the utility of different prescribed burning treatments in suppressing the tree. By demonstrating that succession may shape abundance-occupancy relationships in a community evolved under fire, and that prescribed burning may increase aspen encroachment, it is hoped this study will be used to help guide management decisions in the Fescue Grasslands in PANP, and perhaps other Fescue Prairies.

2.3 Methods

2.3.1 Study site

This research was conducted in the rough fescue (*Festuca hallii* (Vasey) Piper) dominated grasslands of Prince Albert National Park (PANP), Saskatchewan, Canada (53°36 N, 106°31 W). The study site lies within the Boreal Transition Ecoregion, but patches of the more southerly Aspen Parkland Ecoregion are common (Acton et al., 1998). As such, patches of Fescue Grassland dominated by plains rough fescue occur amongst deciduous forest dominated by trembling aspen (*Populus tremuloides* Michx.) in the southern portion of PANP. Prior to c.1965, cattle grazing and haying occurred intermittently on the study site. The area receives occasional utilization from plains bison (*Bison bison bison* L.) and elk (*Cervus elaphus* L.). Anthropogenic influences include light foot traffic from park visitors, and a trail and fireguards that bisect the site. The majority of soils in the area are classified as Orthic Black Chernozems occurring on coarse to moderately coarse textured glaciofluvial deposits (Padbury et al., 1978).

2.3.2 Data collection

The prescribed burn experiment on which this study is based was setup and surveyed in 1975, with the intent of determining optimal prescribed burning treatments to suppress trembling aspen encroachment into the Fescue Grasslands (Gunn et al., 1976; Trottier, 1985). Three areas of Fescue Grassland were utilized for the study; Wasstrom's Flats, Rabbit Creek and Sugar Creek (Fig. 2-1). To evaluate the success of the different prescribed burn treatments in controlling trembling aspen, plots were set up in Fescue Grassland and Fescue Grassland-forest transition communities (Gunn et al., 1976; Trottier, 1985). Forest transition plots were positioned in areas where trembling aspen encroachment was evident in 1975. Grassland plots were positioned in adjacent grassland areas relatively free of trembling aspen in 1975. A total of 13 plots were placed in the forest transition community and 11 in the adjacent grassland community (Fig. 2-1). Each plot contained 25-1 m^2 permanent quadrats laid out in a square grid (Fig. 2-2). The 1 m^2 quadrats were used to collect cover data for each species in all of the plots (Appendix A). In the forest transition plots, a 2 m^2 permanent quadrat was also used to enumerate woody species density (Fig. 2-2). Species cover data were then collected on a total of 24 plots that contained a total of 600 permanent 1 m^2 quadrats (Appendix B), and stem density data was collected on 13 forest transition plots that contained a total of 325 permanent 2 m^2 quadrats (Appendix C, Appendix J).

Prescribed burns were conducted between 1975 and 1983, with plots receiving one of four burn treatments: five fall burns, four fall burns, three fall burns or four spring burns (Table 2-1). After burning, follow-up surveys of all permanent plots were conducted in 1983, and again in 1995 and 2010. The resulting dataset thus captures plant community structure prior to burning in 1975, after burning in 1983, after a moderate length of time since burning in 1995 and after a longer period of time since burning in 2010. In each permanent 1 m^2 quadrat, cover classes of all vascular plant species (1: 1-10%, 2: 11-20% ... 10: 91-100%) were recorded during the summers of 1975, 1983, and 1995. Percent cover was recorded in 2010 and converted to cover class for uniform treatment of data from all survey years. For analysis, the cover class data was converted to mid-point averages (1: 5%, 2: 15%... 9: 95%) (Appendix B). To address potential identification issues stemming from different observers between years, it was necessary to group a small number of species to the genus level (Appendix A). Genus level grouping of species occurred if species were grouped or a genus level of identification was used in any of the survey periods. If other instances where species identification could not be certain a genus level of identification was also used.

In each 2 m^2 quadrat, density and cover of trembling aspen (*Populus tremuloides* Michx.), saskatoon (*Amelanchier alnifolia* (Nutt.) Nutt. ex. M. Roemer), chokecherry (*Prunus virginiana* L.), bog birch (*Betula pumila* var. *glandulifera* Regel) and Bebb's willow (*Salix bebbiana* Sarg.) were recorded. Density was subjectively recorded as number of stems for trembling aspen and saskatoon, and number of discernable clumps of bog birch and Bebb's willow (Gunn et al., 1976; Trottier, 1985). As woody species density and cover data from 1975 and 1983 were only available by plot averages, woody species density and cover analyses were conducted on mean plot density and mean plot cover (Appendix C).

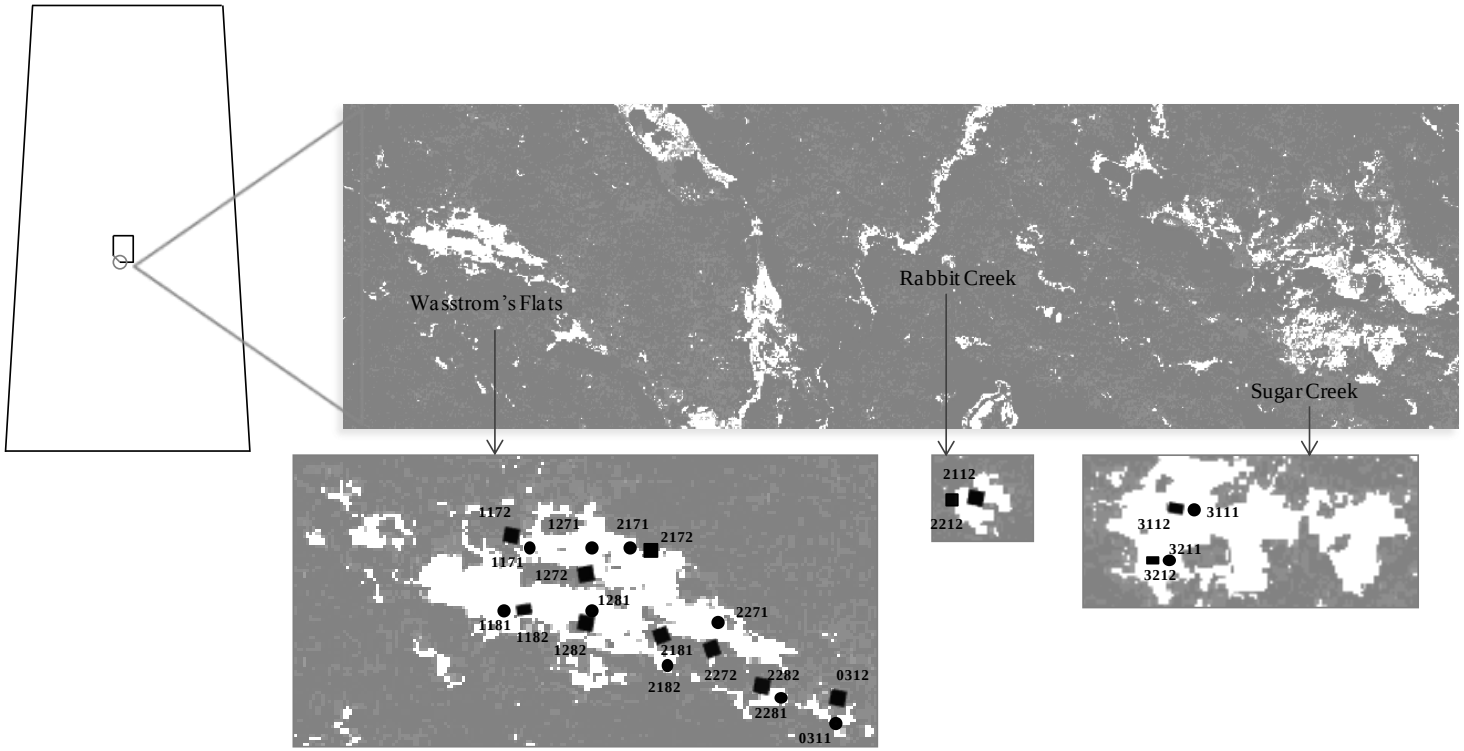

Figure 2-1. Map of the study site showing relative location of Prince Albert National Park. The Prince Albert National Park inset shows separate grassland areas; Wasstrom's Flats, Rabbit Creek and Sugar Creek. Each grassland area is shown in more detail with approximate plot locations and plot numbers. Grassland plot locations are shown by circles with plot numbers ending in '1'. Forest transition plots are shown by squares with plot numbers ending in '2'. UTM locations of all quadrats within plots are provided in Appendix G.

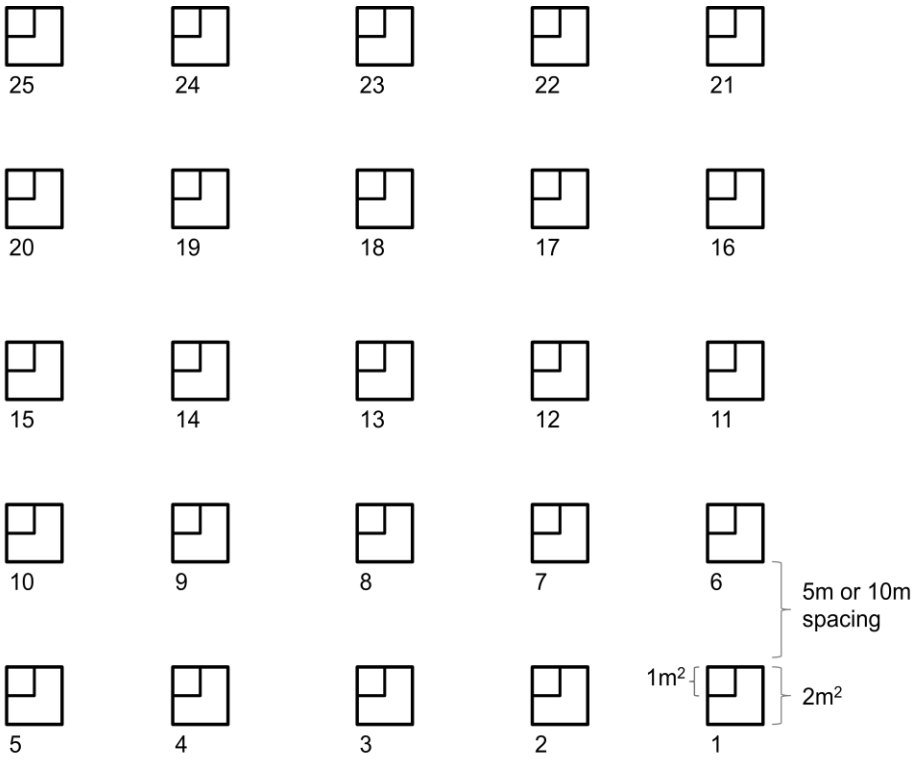

Figure 2-2. Layout of permanent quadrat locations within each plot used in the prescribed burn study in Prince Albert National Park, 1975-2010. Spacing between quadrats varied with site characteristics at each plot. Quadrats were generally separated by 10 m, with 5 m x 10 m or 5 m x 5 m spacing used if needed. Only forest transition plots contained 2 m^2 quadrats, while both grassland and forest transition plots contained 1 m^2 quadrats (modified from Trottier 1985). UTM locations of all quadrats are provided in Appendix G.

Table 2-1. Prescribed burn treatment combinations used in the Prince Albert National Park prescribed burn study 1975-2010. Grassland areas include Wasstrom's Flats, Rabbit Creek and Sugar Creek. Plots were set out in grassland and forest transition plant communities (grassland-trembling aspen forest ecotone where trembling aspen encroachment was evident in 1975). Plot numbers correspond to approximate plot locations within each community type, and indicate the number of plots subjected to different season of burning (fall or spring) and number of burns treatments (three, four or five) treatment combinations applied between 1975 and 1982. No grassland plots were established in the Rabbit Creek grassland. Only two control plots were established; one in each of the grassland and forest transition plant communities, and both in the Wasstrom's Flats grassland area.

Grassland Area	Grassland Plots	Forest Transition Plots	Season	Number of Burns	Year Burned
Wasstrom's Flats	1271, 1281	1272, 1282	Fall	Three	1975, 1979, 1980
Wasstrom's Flats	1171, 1181	1172, 1182	Fall	Five	1975, 1976, 1979, 1980, 1981
Wasstrom's Flats	2171, 2181, 2271, 2281	2172, 2182, 2272, 2282	Spring	Four	1976, 1977, 1981, 1982
Wasstrom's Flats	0311	0312	-	-	-
Rabbit Creek	-	2212	Fall	Four	1975, 1976, 1980, 1981
Rabbit Creek	-	2112	Spring	Four	1976, 1977, 1981, 1982
Sugar Creek	3111	3112	Fall	Four	1975, 1976, 1980, 1981
Sugar Creek	3211	3212	Spring	Four	1976, 1977, 1981, 1982

2.3.3 Statistical analysis

As plots were subjectively set in grassland and forest transition communities, it was necessary to examine how plant community structure differed between the two groups, and to describe the overall plant community composition at the study site. A multi-response permutation procedure (MRPP) was used with 2010 species cover data to assess if the a-priori determined grassland and forest transition communities were significantly different. MRPP is a non-parametric procedure useful for testing the null hypothesis of no significant differences in community composition between groups (Mielke, 1984; Mielke and Berry, 2001). To conduct the MRPP, a Sorensen distance matrix of species cover in plots was grouped by community type (grassland or forest transition) using a natural weighting for within-group distance (Mielke, 1984). Sorensen distance was used as the proportion of shared abundances of species was of interest, and is also less sensitive to outliers.

ISA was used to describe species differences between grassland and forest transition community groups. Indicator Species Analysis (ISA) combines information on the faithfulness of a species abundance and frequency to a particular group, producing indicator species values for each species in each group based on standards of a perfect indicator (100% faithfulness to a group). For the ISA, 1000 randomizations were used in the Monte Carlo test for significance of the observed indicator species values (Dufrene and Legendre, 1997).

Unconstrained Non-metric Multidimensional Scaling (NMS) ordinations were then used to provide a general species description of grassland (11 plots x 95 species) and forest transition (13 plots x 113 species) plant communities in 2010 (Mather 1976). 2010 mean plot cover data were used to simplify the data set and provide a current representation of the study site. To see how successional pathways in plots changed over time, another NMS was conducted on mean grassland (44 plots x 115 species) and forest transition (52 plots x 131 species) plot cover data from 1975, 1983, 1995 and 2010 to create plot successional vectors of each plot through time. NMS was used as it is avoids assumptions of linear relationships and normality among variables, and was run using the autopilot option with slow and thorough mode and Sorensen distance. Dimensionality of NMS ordinations was determined by reviewing scree plots; examining stress in relation to dimensionality. The MRPP, Indicator Species Analysis and NMS were conducted in PC-ORD 5 (McCune and Mefford, 1999).

2.4 Results

The grassland and forest transition communities were significantly different (t=-7.07; P<0.001). The negative test-statistic indicated a strong separation between these groups, while the low effect size (A=0.10) also indicated substantial variation in species composition within each of grassland and forest transition communities. The MRPP confirmed that separate treatment of the grassland and forest transition plots was necessary in further analyses. Indicator Species Analysis showed grassland plots were best indicated by species such as *Koeleria macrantha* (Ledeb.) J.A. Schultes, *Agoseris glauca* (Pursh) Raf., *Sisyrinchium montanum* Greene, *Comandra umbellata* ssp. *pallida* (A. DC.) Piehl, *Danthonia intermedia* Vasey, and *Hesperostipa* spp. (Table 2-2), while forest transition plots were best indicated by species such as *Elymus villosus* Muhl. ex Willd., *Populus tremuloides* Michx., *Bromus* spp., *Schizachne purpurascens* (Torr.) Swallen, *Rubus* spp., *and Vaccinium caespitosum* Michx. (Table 2-3). Species common to both communities at the study site may not show up in the Indicator Species Analysis because they cannot be used to differentiate between the forest transition and grassland communities. Common species present in at least 75% of all plots across all years are shown in Table 2-4.

Table 2-2. Monte Carlo test of significance of observed maximum indicator value (IV) species in the grassland plant community based on 1000 randomizations. The means and standard deviations (SD) of the indicator values from the randomizations are provided, as well as p-values testing the hypothesis that there are no differences between grassland and forest transition plant communities. The p-value is based on the proportion of randomized trials with indicator value greater or equal to the observed indicator value. Species with significant p-values are shown and are listed in descending order by indicator value. For a full table of grassland species indicator values see Appendix F.

Species	IV	Mean	SD	p-value
Koeleria macrantha	87.4	49.2	7.8	0.001
Agoseris glauca	78.0	53.5	6.2	0.002
Sisyrinchium montanum	77.5	52.8	7.3	0.002
Comandra umbellata	77.3	53.9	6.2	0.001
Danthonia intermedia	73.5	45.7	9.5	0.006
Hesperostipa spp.	73.2	44.8	9.1	0.008
Achnatherum richardsonii	71.2	54.7	6.8	0.016
Zizia aptera	70.3	52.6	7.0	0.018

Agrostis scabra	69.4	45.6	7.9	0.012
Potentilla arguta	67.1	54.3	6.6	0.036
Anemone multifida	65.5	48.6	7.2	0.025
Artemisia ludoviciana	63.6	39.9	8.6	0.015
Campanula rotundifolia	63.6	53.7	3.3	0.002
Festuca hallii	63.0	54.6	3.8	0.024
Erigeron spp.	62.9	46.5	7.3	0.034
Elymus spp.	60.5	53.7	3.3	0.024
Achillea millefolium	57.8	52.1	2.3	0.001
Pulsatilla patens	57.1	37.4	8.5	0.027
Selaginella densa	56.8	30.8	8.6	0.013
Elymus lanceolatus	54.5	21.8	7.9	0.003
Galium boreale	54.4	51.7	2.1	0.030
Festuca saximontana	53.2	35.5	8.5	0.039
Pascopyrum smithii	52.9	24.3	8.1	0.007
Artemisia campestris	50.6	27.2	8.8	0.022
Arnica fulgens	50.3	23.7	7.7	0.014
Astragalus laxmannii	36.4	16.4	7.2	0.034

Table 2-3. Monte Carlo test of significance of observed maximum indicator value (IV) species in the forest transition plant community based on 1000 randomizations. The means and standard deviations (SD) of the indicator values from the randomizations are provided, as well as p-values testing the hypothesis that there are no differences between grassland and forest transition plant communities. The p-value is based on the proportion of randomized trials with indicator value greater or equal to the observed indicator value. Species with significant p-values are shown and are listed in descending order by indicator value. For a full table of forest transition species indicator values see Appendix F.

Species	IV	Mean	SD	p-value
Elymus villosus	88.6	54.4	8.9	0.001
Populus tremuloides	80.0	57.0	5.6	0.001
Bromus spp.	63.7	45.2	8.1	0.027
Schizachne purpurascens	63.0	40.7	9.5	0.029
Rubus spp.	46.2	22.4	8.5	0.019
Vaccinium caespitosum	38.5	19.2	7.0	0.033

Table 2-4. Common species observed during the prescribed burn study in Prince Albert National Park. Common species in the study site were determined as those occurring in at least 75% of plots over all survey years (1975, 1983, 1995 and 2010). Species common to the forest transition (FT) and grassland (G) community are noted alphabetically, and are indicated by 'x' in the respective columns.

Species	FT	G
Achillea millefolium	x	x
Agastache foeniculum	x	
Agoseris glauca	x	x
Agrostis scabra	x	x
Arctostaphylos uva-ursi	x	x
Artemisia ludoviciana		x
Bromus spp.	x	
Campanula rotundifolia	x	x
Carex spp.	x	x
Comandra umbellata	x	x
Elymus spp.	x	x
Elymus villosus	x	x
Erigeron spp.		x
Festuca hallii	x	x
Fragaria virginiana	x	x
Galium boreale	x	x
Hedysarum alpinum	x	x
Hesperostipa spp.		x
Heuchera richardsonii	x	
Koeleria macrantha	x	x
Lathyrus ochroleucus	x	x
Maianthemum stellatum	x	x
Oxytropis campestris		x
Polygala senega		x
Populus tremuloides	x	x
Rosa acicularis	x	x
Sisyrinchium montanum		x
Symphoricarpos occidentalis		x
Symphyotrichum laeve	x	x
Thalictrum venulosum	x	x
Vicia americana	x	x
Viola adunca	x	x

Ordination of the grassland plant community cover data yielded a three-dimensional solution with a final stress of 1.22. Axis correlations with r≥0.7 for species in the grassland community are listed in Table 2-5. A full list of grassland species-axis correlations in 2010 are provided in Appendix D. The first axis in the grassland plant community accounted for 11.4% of the variation in the distance matrix, the second axis 5.4% and the third axis 64.3% for a total r^2 of 81.1% (Fig. 2-3, Fig. 2-4). The first axis separated shrubs and forest species such as *Lonicera dioica* L., *Salix bebbiana* Sarg., *Bromus* spp., *Maianthemum canadense* Desf., *Solidago canadensis* L., and *Symphyotrichum ciliolatum* (Lindl.) A. Löve & D. Löve from species characteristic of open grassland such as *Artemisia frigida* Willd. The second axis separated plots on a moisture gradient, with xeric sites characterized by *Androsace septentrionalis* L., *Arctostaphylos uva-ursi* (L.) Spreng. and *Cerastium arvense* L., and mesic sites characterized by *Epilobium angustifolium* ssp. *angustifolium* L., *Betula* spp., *Salix bebbiana* Sarg. and *Bromus* spp. The third axis separated the three grassland areas, with the Sugar Creek plots characterized by *Maianthemum canadense* Desf., *Epilobium angustifolium* ssp. *angustifolium* L., *Lonicera dioica* L., *Bromus* spp., *Betula* spp., *Salix bebbiana* Sarg. and *Oryzopsis* spp., and Wasstrom's Flat's characterized by grassland species including *Festuca hallii (*Vasey) Piper, *Hesperostipa* spp., *Koeleria macrantha* (Ledeb.) J.A. Schultes, *Carex* spp., *Elymus* spp., *Achillea millefolium* L., *Campanula rotundifolia* L. and *Symphyotrichum laeve* (L.) A. Löve & D. Löve, and woody species *Prunus virginiana* L. and *Arctostaphylos uva-ursi* (L.) Spreng. The ordination axes show the Sugar Creek plots (3211 and 3111) and the control plot (0311) have an unique composition of shrubs including *Salix bebbiana* Sarg., *Betula* spp., *Lonicera dioica* L., and forbs and grasses including *Calamagrostis* canadensis (Michx.) Beauv., *Solidago canadensis* L. and *Symphyotrichum ciliolatum* (Lindl.) A. Löve & D. Löve that differentiate them from other grassland plots.

Table 2-5. Correlation coefficients (r) between species and ordination axes of the NMS ordination using 2010 mean species cover in the grassland plant community plots (11 plots x 95 species). Only species correlation coefficients with r≥0.7 in any of the axes are shown. For a full list of species axis correlations in the grassland plant community see Appendix D.

Species	Axis 1	Axis 2	Axis 3
Agrostis scabra	-0.360	0.412	-0.860
Amelanchier alnifolia	0.733	0.149	0.077
Antennaria spp.	-0.757	0.063	-0.040
Arctostaphylos uva-ursi	-0.759	0.785	-0.273
Betula spp.	0.331	-0.528	0.885
Carex spp.	-0.246	0.705	-0.775
Cerastium arvense	-0.302	0.764	-0.196
Epilobium angustifolium	0.394	-0.478	0.941
Erigeron spp.	-0.460	0.448	-0.891
Festuca hallii	-0.171	0.413	-0.749
Festuca saximontana	-0.049	0.710	-0.672
Gentiana affinis	-0.095	-0.382	0.779
Helictotrichon hookerii	0.358	-0.261	0.796
Lathyrus ochroleucus	0.184	-0.445	0.967
Lonicera dioica	0.438	-0.425	0.848
Maianthemum canadense	0.291	-0.375	0.794
Oryzopsis spp.	0.202	-0.353	0.756
Oxytropis campestris	-0.796	0.174	-0.587
Pascopyrum smithii	-0.210	0.706	-0.449
Pinus banksiana	-0.706	0.031	-0.051
Polygala senega	-0.433	0.707	-0.614
Prenanthes racemosa	0.322	-0.200	0.708
Rosa acicularis	0.632	-0.703	0.516
Salix bebbiana	0.443	-0.495	0.958
Solidago canadensis	0.526	-0.603	0.941
Solidago missouriensis	-0.652	0.534	-0.831
Symphyotrichum ciliolatum	0.601	-0.613	0.782
Thalictrum venulosum	0.357	-0.544	0.884
Vicia americana	0.416	-0.575	0.909

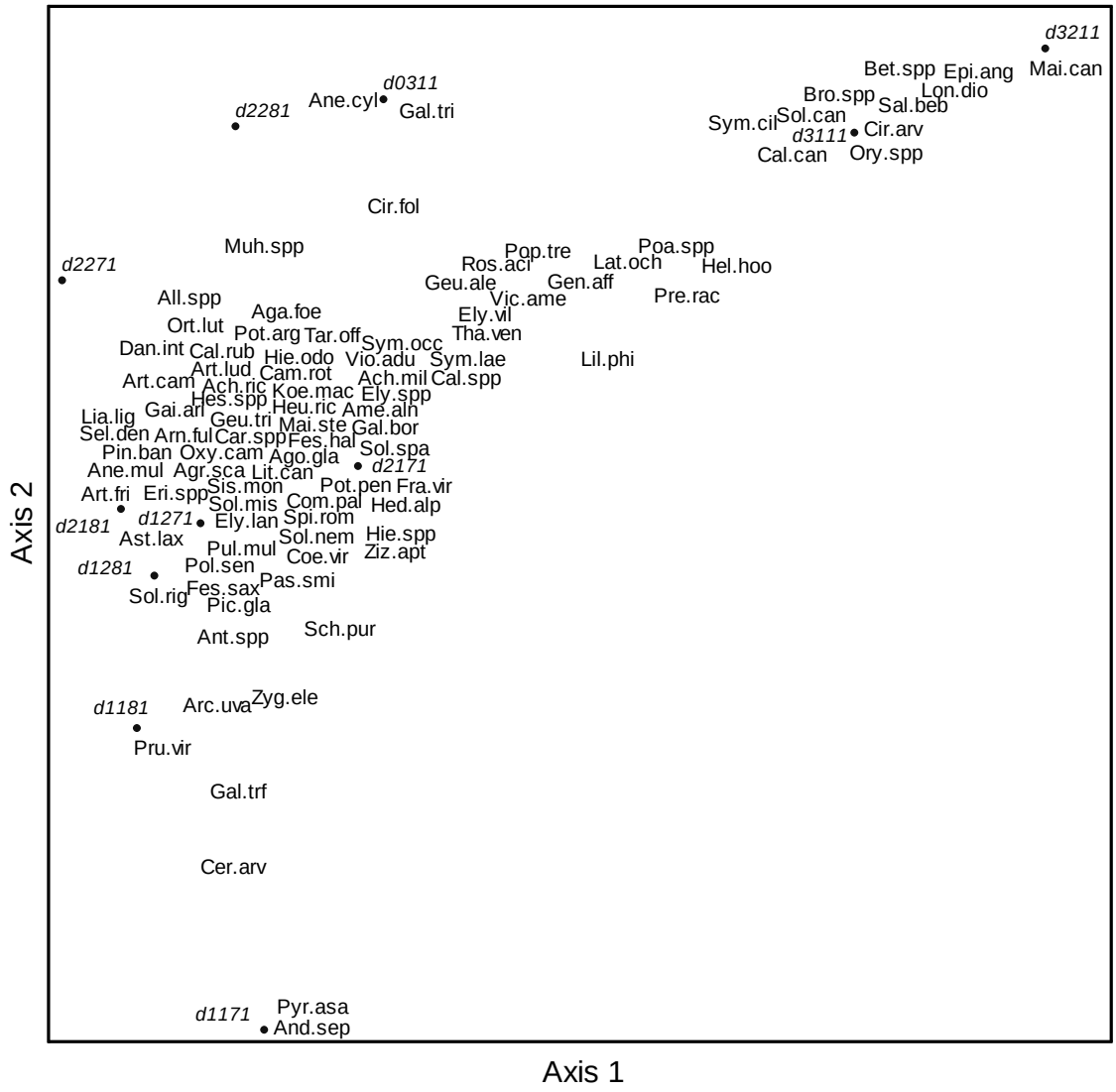

Figure 1-3. Three-dimensional ordination of plots in species space (11 plots x 95 species) using 2010 mean species cover in the grassland plant community plots. Plot labels (plot number preceded by 'd' indicating 2010 survey year) represent relative centroid of each plot, and species epithets represent the relative centroid of each species. The ordination yielded a three-dimensional solution with a final stress of 1.22. Axis 1 accounted for 11.4% and Axis 2 accounted for 5.4% of variation in the distance matrix. Axis 3 accounted for 64.3% of variation in the distance matrix, and is shown in Fig. 2-4.

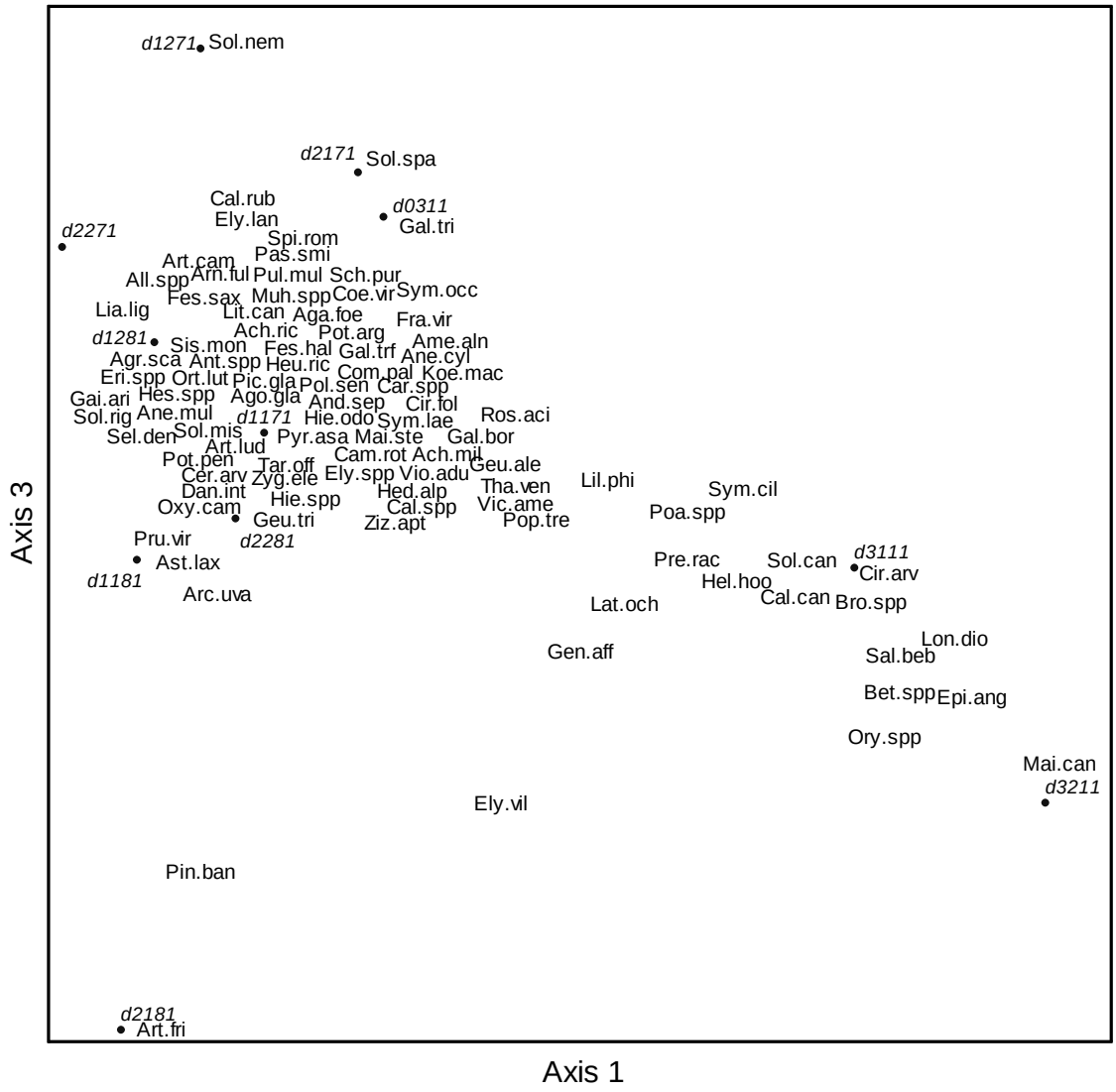

Figure 2-4. Three-dimensional ordination of plots in species space (11 plots x 95 species) using 2010 mean species cover in the grassland plant community plots. Plot labels (plot number preceded by 'd' indicating 2010 survey year) represent relative centroid of each plot, and species epithets represent the relative centroid of each species. The ordination yielded a three-dimensional solution with a final stress of 1.22. Axis 1 accounted for 11.4% and Axis 3 accounted for 64.3% of variation in the distance matrix. Axis 2 accounted for 5.4% of variation in the distance matrix, and is shown in Fig. 2-3.

Ordination of the grassland cover data over all survey periods was used to examine successional patterns at the site. This ordination yielded a three-dimensional solution with a final stress of 12.86. Grassland species-axis correlations for this analysis are listed Appendix D. The first grassland plant community axis accounted for 17.9% of the variation in the distance matrix, the second axis 33.4% and the third axis 31.4% for a total r^2 of 82.7% (Fig. 2-5, Fig. 2-6). The first axis separated plots by year, the second axis separated plots by area, and the third axis separated plots characterized by forest species from those charactertized by grassland species. Plots surveyed in 1975 were characterized by *Monarda fistulosa* L., *Poa* spp., *Sonchus* spp. and *Mulgedium oblongifolium* (Nutt.) Reveal in the Wasstrom's Flats area, and *Bromus* spp. and *Solidago rigida* L. in the Sugar Creek Plots. Plots surveyed in 1983 were characterized by *Oxytropis campestris* (L.) DC., *Agoseris glauca* (Pursh) Raf., *Anemone multifida* Poir. and *Galium boreale* L. Plots surveyed in 1995 were characterized by *Festuca hallii* (Vasey) Piper, *Elymus* spp.and *Artemisia ludoviciana* Nutt. Plots surveyed in 2010 were characterized by tall forb species including *Geum aleppicum* Jacq. and *Liatris ligulistylis* (A. Nelson) K. Schum., and low forb species including *Pulsatilla patens* ssp. *multifida* (Pritz.) Zamels, *Cirsium foliosum* (Hook.) DC. and *Fragaria virginiana* Duchesne. Successional vectors linking grassland plots over time show plots generally move in unison with slight differences by grassland area. Species ordinations of grassland plots for all years are shown in Appendix E.

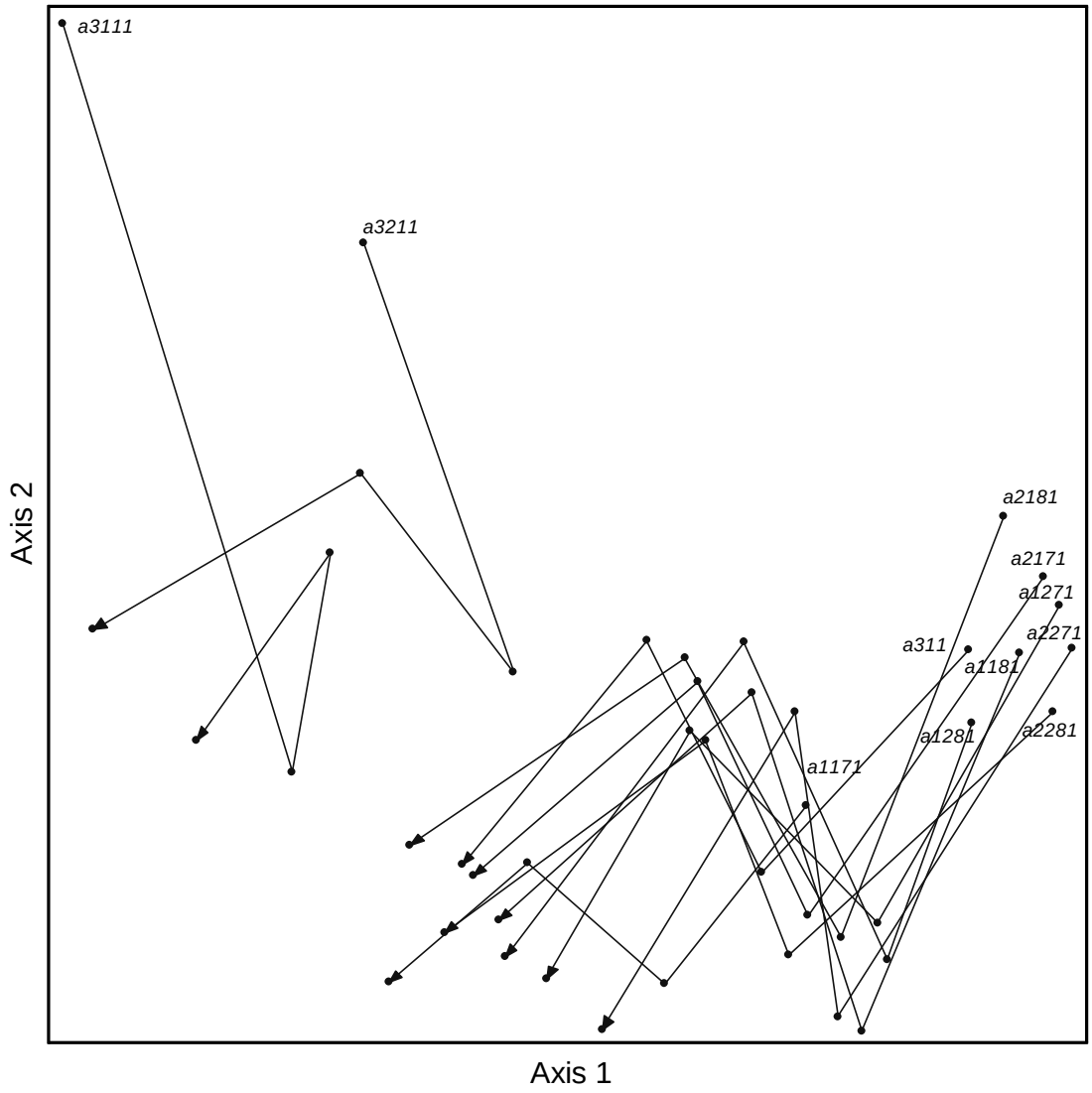

Figure 2-5. Successional vectors joining grassland plant community plot in species space (44 plots x 115 species) using observations throughout the prescribed burn study 1975-2010. Initial position in 1975 is marked by plot number (beginning in 'a'; to indicate the 1975 pre-burn position) and the final position in 2010 is indicated by the arrow. The ordination yielded a three-dimensional solution with a final stress of 12.86. Axis 1 accounted for 17.9% and Axis 2 accounted for 33.4% of variation in the distance matrix. Axis 3 accounted for 31.4% of variation in the distance matrix, and is shown in Fig. 2-6.

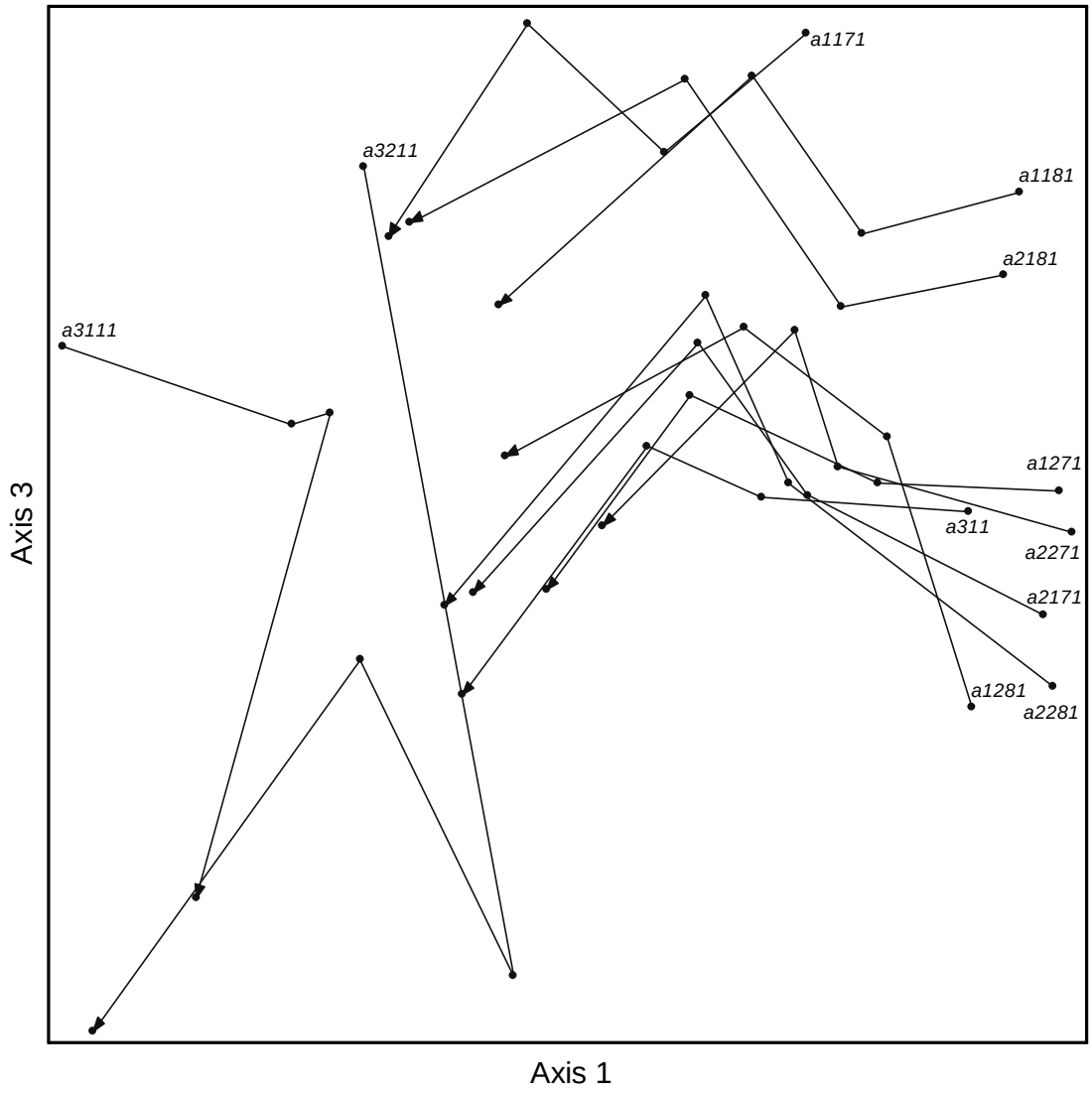

Figure 2-6. Successional vectors joining grassland plant community plot in species space (44 plots x 115 species) using observations throughout the prescribed burn study 1975-2010. Initial position in 1975 is marked by plot number (beginning in ‘a’; to indicate the 1975 pre-burn position) and the final position in 2010 is indicated by the arrow. The ordination yielded a three-dimensional solution with a final stress of 12.86. Axis 1 accounted for 17.9% and Axis 3 accounted for 31.4% of variation in the distance matrix. Axis 2 accounted for 33.4% of variation in the distance matrix, and is shown in Fig. 2-5.

Ordination of the 2010 forest transition cover data yielded a three-dimensional solution with a final stress of 3.21. Forest transition species-axis correlations with r≥0.7 are listed in Table 2-6. A full list of 2010 forest transition species-axis correlations are provided in Appendix D. The first forest transition plant community axis accounted for 25.5% of the variation in the distance matrix, the second axis 38.1% and the third axis 26.1% for a total r^2 of 89.7% (Fig. 2-7, Fig. 2-8). The first axis separated plots by grassland area, with Sugar Creek plots (3112 and 3212) characterized by *Cirsium arvense* (L.) Scop., *Poa* spp., *Prenanthes racemosa* Michx., *Lonicera dioica* L. and *Symphyotrichum ciliolatum* (Lindl.) A. Löve & D. Löve, Wasstrom's Flats plots characterized by *Symphyotrichum laeve* (L.) A. Löve & D. Löve, *Calamagrostis* spp., *Festuca hallii* (Vasey) Piper, *Achillea millefolium* L., *Hieracium* spp., *Potentilla arguta* Pursh and *Galium boreale* L., and Rabbit Creek plots characterized by forest and weedy species such as *Sonchus* spp., *Bromus inermis* Leyss., *Calamagrostis rubescens* Buckl. and *Mitella nuda* L. The second axis separated the control plot (0312) characterized by species such as *Aralia nudicaulis* L., *Prunus pensylvanica* L. f., *Prunus viginiana* L. and *Rubus pubescens* Raf. The third axis again separated the control plot from remaining forest transition plots, and appears to represent a gradient from species characteristic of grassland such as *Allium* spp., *Artemisia campestris* L., *Zygadenus elegans* Pursh and *Comandra umbellata* ssp. *pallida* (A. DC.) Piehl, to those characteristic of forest areas such as *Lycopodium* spp., *Mertensia paniculata* (Ait.) G. Don, and *Corylus cornuta* Marsh.

Table 2-6. Correlations coefficients (r) between species and ordination axes of the NMS ordination using 2010 mean species cover in the forest transition plant community plots (13 plots x 113 species). Only species with correlation coefficients r≥0.7 in any of the axes are shown. For a full list of species axis correlations in the forest transition community see Appendix D.

Species	Axis 1	Axis 2	Axis 3
Achillea millefolium	-0.903	0.455	0.248
Agastache foeniculum	0.747	-0.169	0.142
Agrostis scabra	-0.230	0.440	0.708
Amelanchier alnifolia	0.752	-0.330	0.375
Apocynum androsaemifolium	0.795	-0.441	0.227
Aralia nudicaulis	0.795	-0.441	0.227
Arctostaphylos uva-ursi	-0.548	0.468	0.713
Bromus spp.	0.172	0.064	-0.876
Campanula rotundifolia	-0.725	0.367	0.630
Comandra umbellata	-0.664	0.284	0.743
Corylus cornuta	0.819	-0.439	0.160
Disporum trachycarpum	0.795	-0.441	0.227
Galium boreale	-0.296	-0.008	0.707
Koeleria macrantha	-0.515	0.344	0.712
Lathyrus venosus	0.793	-0.438	0.225
Lonicera dioica	0.173	-0.819	0.020
Lysimachia ciliata	0.795	-0.441	0.227
Muhlenbergia spp.	0.781	-0.391	-0.027
Oryzopsis spp.	0.762	-0.349	0.178
Petasites frigidus	0.795	-0.441	0.227
Populus tremuloides	0.168	0.405	-0.841
Prenanthes racemosa	0.190	-0.802	0.090
Prunus pensylvanica	0.795	-0.441	0.227
Prunus virginiana	0.795	-0.441	0.227
Rubus pubescens	0.795	-0.441	0.227
Sisyrinchium montanum	-0.342	0.568	0.726
Solidago canadensis	0.021	-0.736	-0.379
Solidago missouriensis	-0.479	0.353	0.753
Symphyotrichum ciliolatum	-0.191	-0.707	-0.070
Symphyotrichum laeve	-0.499	0.449	0.704
Symphoricarpos occidentalis	0.734	-0.365	0.371
Vicia americana	-0.415	-0.733	0.073
Viola adunca	-0.207	0.715	0.006
Viola canadensis	0.795	-0.441	0.227

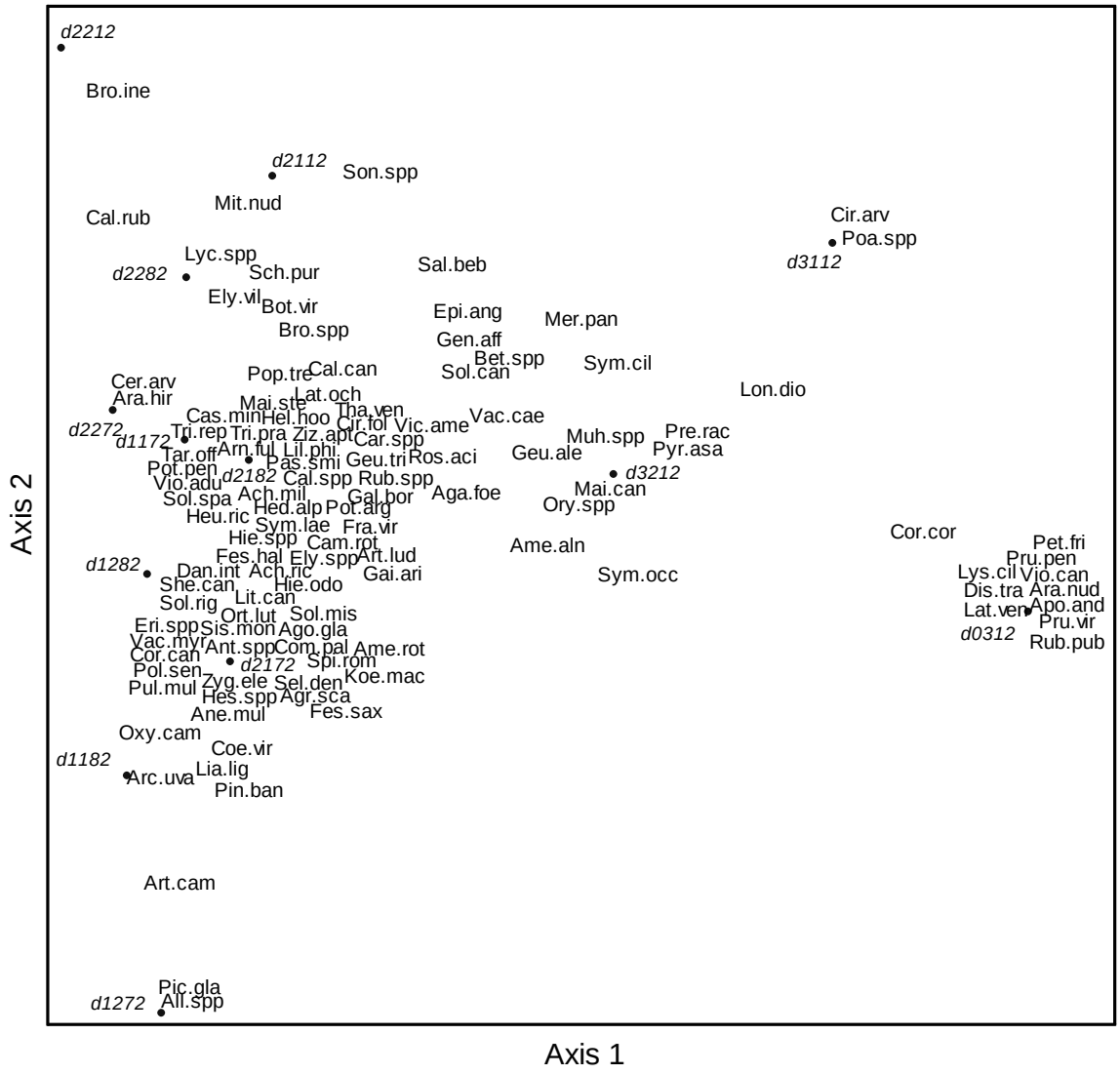

Figure 2-7. Three-dimensional ordination of plots in species space (13 plots x 113 species) using 2010 mean species cover in the forest transition plant community plots. Plot labels (plot number preceded by 'd' indicating 2010 survey year) represent relative centroid of each plot, and species epithets represent the relative centroid of each species. The ordination yielded a three-dimensional solution with a final stress of 3.21. Axis 1 accounted for 25.5% and Axis 2 accounted for 38.1% of variation in the distance matrix. Axis 3 accounted for 26.1% of variation in the distance matrix, and is shown in Fig. 2-8.

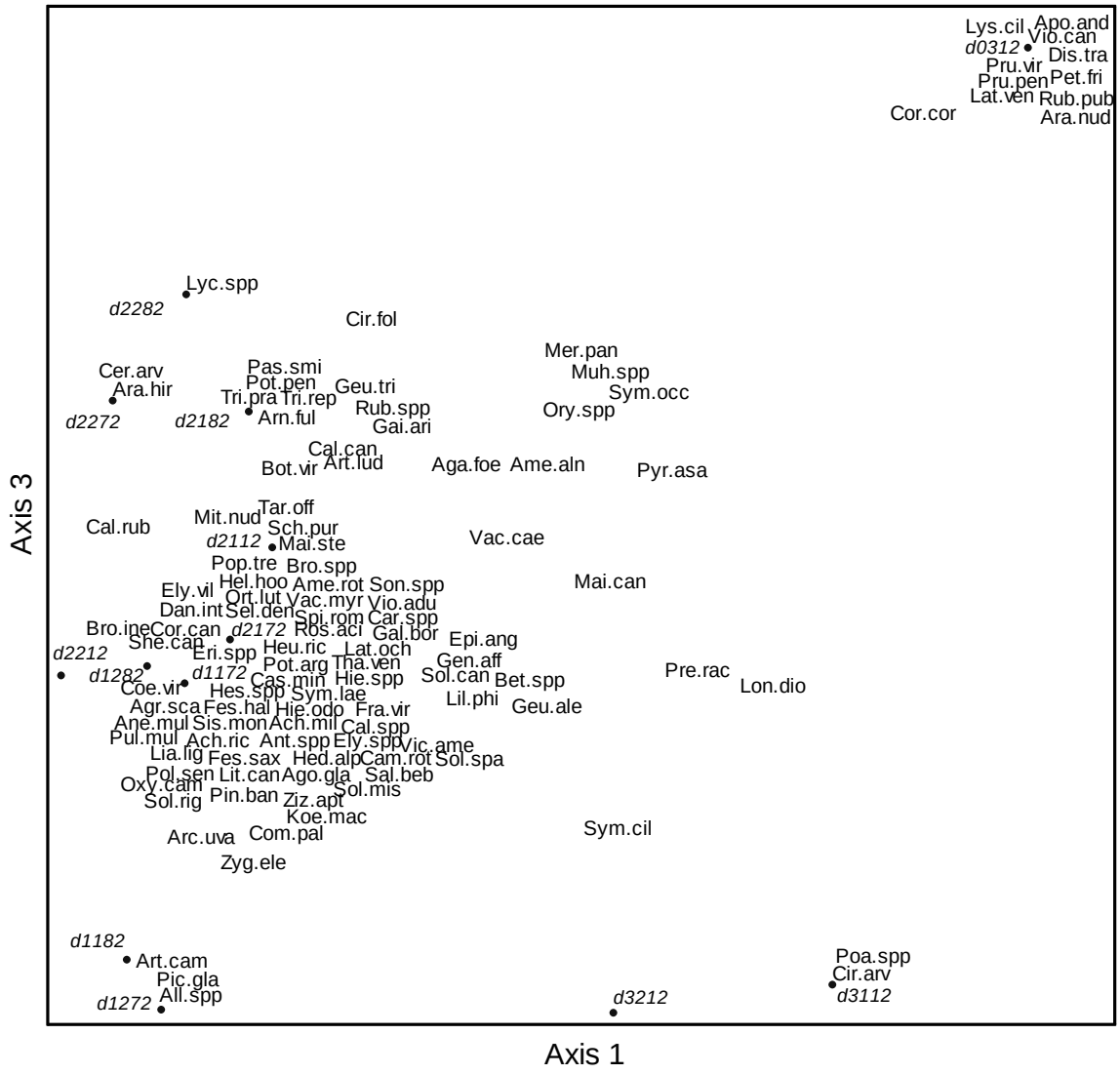

Figure 2-8. Three-dimensional ordination of plots in species space (13 plots x 113 species) using 2010 mean species cover in the forest transition plant community plots. Plot labels (plot number preceded by 'd' indicating 2010 survey year) represent relative centroid of each plot, and species epithets represent the relative centroid of each species. The ordination yielded a three-dimensional solution with a final stress of 3.21. Axis 1 accounted for 25.5% and Axis 3 accounted for 26.1% of variation in the distance matrix. Axis 2 accounted for 38.1% of variation in the distance matrix, and is shown in Fig. 2-7.

Ordination of the forest transition cover data over all survey periods was used to examine successional patterns at the site. This ordination yielded a three-dimensional solution with a final stress of 13.98. Forest transition species-axis correlations over all years are listed in Appendix D. The first forest transition plant community axis accounted for 27.4% of the variation in the distance matrix, the second axis 23.5% and the third axis 33.0% for a total r^2 of 83.9% (Fig. 2-9, Fig. 2-10). The first axis appeared to separate plots by year, the second axis separated 1975 Rabbit Creek and Sugar Creek plots, and the third axis separated species more characteristic of grassland from forest species. In general, plots moved towards increasing characterization by forest species. Plots surveyed in 1975 were characterized by *Hesperostipa* spp., *Solidago rigida* L., *Anemone canadensis* L. and *Bromus*spp. Plots surveyed in 1983 were characterized by forbs including *Polygala senega* L., *Liatris ligulistylis* (A. Nelson) K. Schum., *Gentianella amarella* ssp. *acuta* (Michx.) J. Gillett and *Hedysarum alpinum* L. Plots surveyed in 1995 were characterized by *Festuca hallii* (Vasey) Piper, *Danthonia intermedia* Vasey, *Hierarchloe odorata* (L.) Beauv., and *Symphoricarpos occidentalis* Hook. Plots surveyed in 2010 were characterized by forest species such as *Mitella nuda L., Calamagrostis canadensis* (Michx.) Beauv., *Vaccinium myrtilloides* Michx., *Salix bebbiana* Sarg., *Lonicera dioica* L., and *Amerorchis rotundifolia* (Banks ex Pursh) Hultén. Successional vectors linking forest transition plots over time show plots generally move in unison. Species ordinations in the forest transition plots over all years are shown in Appendix E.

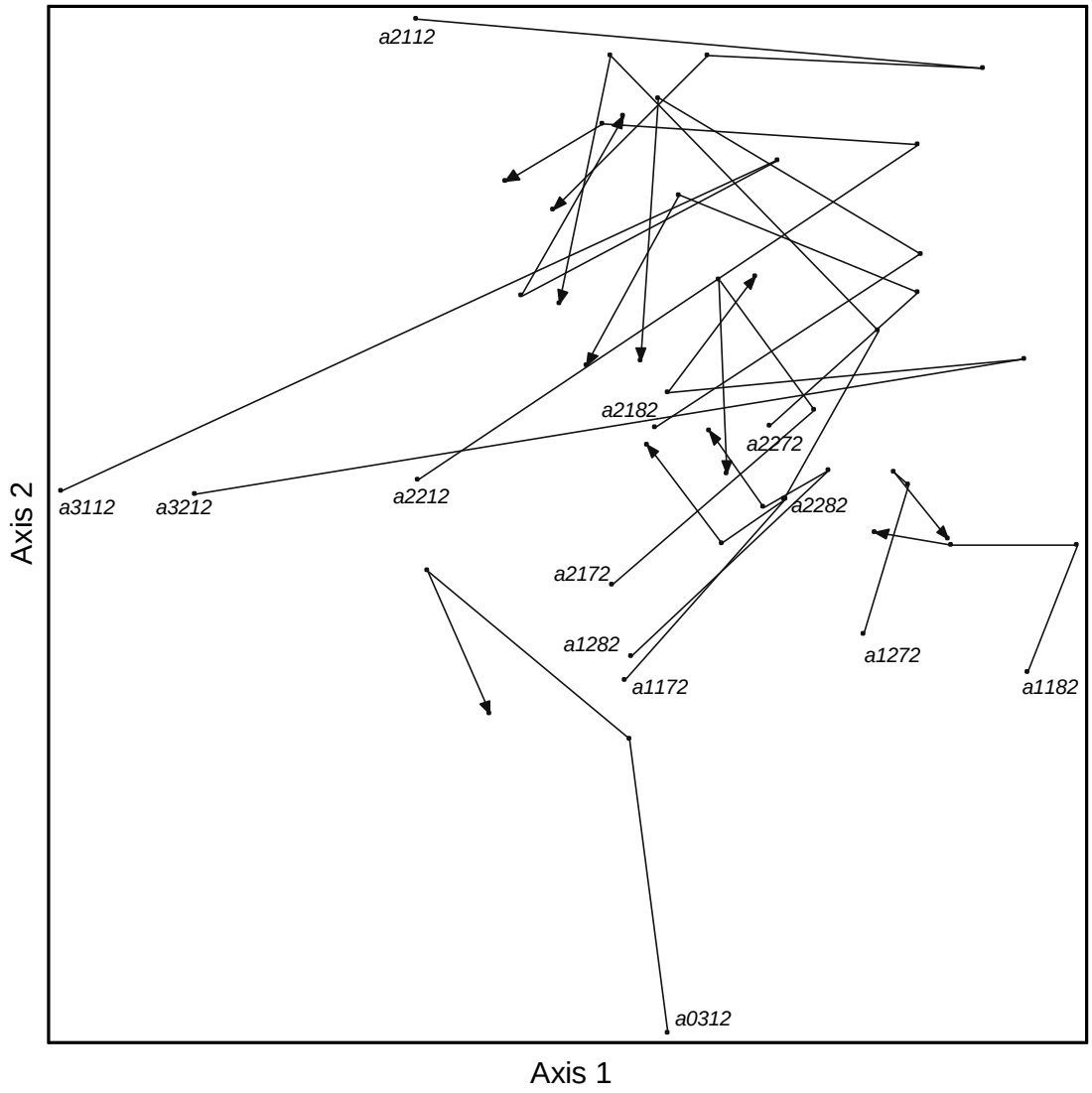

Figure 2-9. Successional vectors joining forest transition plant community plots in species space (52 plots x 131 species) using observations throughout the prescribed burn study 1975-2010. Initial position in 1975 is marked by the plot number (beginning in 'a' to indicate pre-burn in 1975) and the final position in 2010 is indicated by the arrow. The ordination yielded a three-dimensional solution with a final stress of 13.98. Axis 1 accounted for 27.4% and Axis 2 accounted for 23.5% of variation in the distance matrix. Axis 3 accounted for 33.0% of variation in the distance matrix, and is shown in Fig. 2-10.

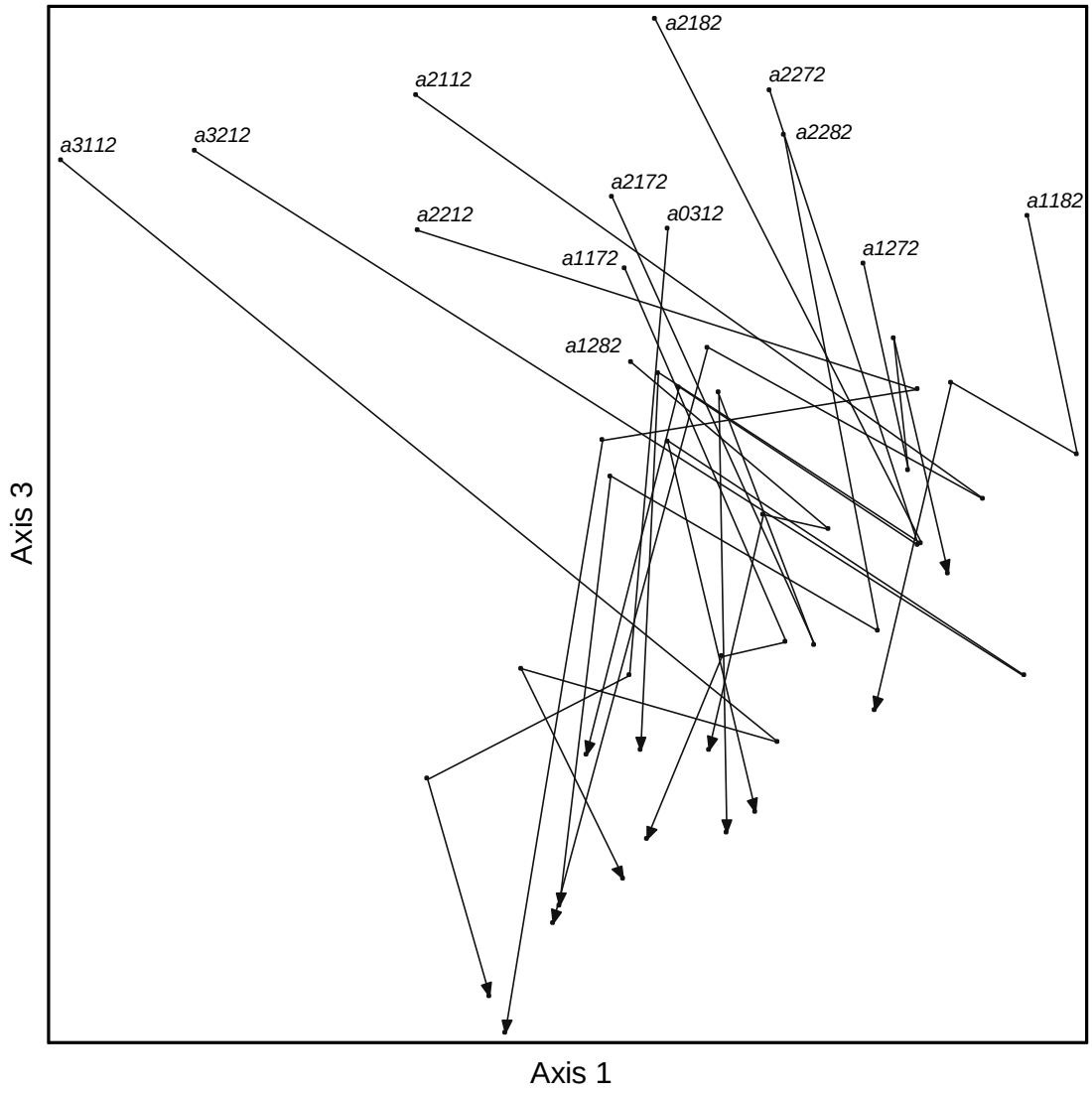

Figure 2-10. Successional vectors joining forest transition plant community plots in species space (52 plots x 131 species) using observations throughout the prescribed burn study 1975-2010. Initial position in 1975 is marked by the plot number (beginning in 'a' to indicate pre-burn in 1975) and the final position in 2010 is indicated by the arrow. The ordination yielded a three-dimensional solution with a final stress of 13.98. Axis 1 accounted for 27.4% and Axis 3 accounted for 33.0% of variation in the distance matrix. Axis 2 accounted for 23.5% of variation in the distance matrix, and is shown in Fig. 2-9.

2.5 Discussion

The MRPP, ISA and NMS ordinations show important trends that guide treatment of the data in the following chapters, as well as describe the study site. Ordination of the grassland 2010 cover data indicate strong differences between Sugar Creek and Wasstrom's Flats areas, and also separate the grassland control plot. Successional vectors linking 1975, 1983, 1995 and 2010 however show grassland plots had coordinated change in plant community over time. Similarly, ordination of the forest transition 2010 cover data indicates strong differences between Wasstrom's Flats, Rabbit Creek and Sugar Creek, and clearly separates the forest transition control plot. Successional vectors linking 1975, 1983, 1995 and 2010 forest transition plots also showed uniform change in the plant community over time.

Trends in the data separating areas and control plots were accounted for in the following chapters. Only data from Wasstrom's Flats was used in the abundance-occupancy relationship study in Chapter 3, eliminating bias from different grassland areas. A mixed-model was used in the trembling aspen encroachment study in Chapter 4, accounting for bias from different grassland areas. The control plots were excluded from the abundance-occupancy relationship, trembling aspen cover and trembling aspen density analyses.

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Chapter 3 preamble

This chapter identifies important patterns in abundance-occupancy relationships within the grassland plant community with succession. Change in pattern of abundance-occupancy relationships within the grassland plant community, and likely other communities commonly exposed to disturbance, demonstrates variations in these patterns over time. The abundance-occupancy relationships in the forest transition plant community, however, remained constant and did not change with time since prescribed burning. The variability of AOR within and between plant communities is important as succession has not been previously considered as a mechanism driving abundance-occupancy relationships. In addition, many studies targeting understanding abundance-occupancy relationships are conducted on comparatively large scales extending beyond the plant community. As such, communities that may have differing patterns in abundance-occupancy relationships, but are presumed to be similar, are grouped into broader large-scale categories. The results of this chapter suggest groupings of communities may over look significant differences in abundance-occupancy relationships that occur over time since disturbance. Also, as variability in abundance-occupancy relationships differs between grassland and grassland-forest transition plant communities, changes to this variability may serve as an indicator of change in plant community structure, where loss of grassland to trembling aspen encroachment may be occurring.

This chapter relates to the overall thesis by addressing the study objectives: to assess long-term changes in plant community structure in the Fescue Grasslands of PANP over time since prescribed burning, and to assess risks from trembling aspen encroachment associated with these changes. Specifically, the relationship between abundance and occupancy of species in grassland and forest transition plant communities is assessed to see how these patterns change through time since prescribed burning.

3.0 Succession creates variability in abundance-occupancy relationships within and between plant communities

3.1 Abstract

A positive relationship between abundance and occupancy of species (AOR) is commonly observed in ecological communities, but the mechanisms driving this pattern are not fully understood. Succession after disturbance is an important factor structuring many plant communities, yet little is known about how it may shape AORs within and between communities. How AORs change over time within a community is also not well understood. We evaluated the changes in interspecific AORs following burning in grassland and forest transition plant communities using a 35- year dataset. An increase in species abundance relative to occupancy was observed in surveys conducted both shortly after and 28 years after the last burn event in the grassland community. Interestingly, AORs in the adjacent grassland-forest ecotone (forest transition plant community) did not change through time. Removal of litter and changes in soil resources with burning may have caused changes to plant community structure, explaining shifts in grassland AORs. Consistent AORs in the forest transition plant community reflect the dominant trembling aspen canopy perpetuated by burning. Although exact mechanisms behind the observed changes in AOR are hard to determine, the phenomenon of change within and between communities over time since disturbance has not been previously documented. Succession should be considered as a mechanism influencing AORs in communities impacted by disturbance.

3.2 Introduction

The tendency for locally abundant species to be widely distributed and locally rare species to be restricted in occurrence is a generally accepted ecological rule (Gaston, 1999; Blackburn et al., 2006; Borregaard and Rahbek, 2010). The abundance-occupancy relationship (AOR) between the density of individuals of a species within a local area (abundance) and their

distribution in space (occupancy) can vary from negative to strongly positive; however, positive relationships have been widely documented over a wide range of taxa and spatial scales (Gaston and Lawton, 1990). While many studies have examined how the shape of AORs vary between taxa and communities, few studies have examined how AORs may change over time within communities (Webb et al., 2007). This gap is particularly important since disturbance and subsequent successional patterns are major factors shaping patterns of community composition, biomass, and species abundance and distribution.

Disturbance is a natural component of an ecosystem that maintains ecological resilience through perturbation; directly injuring or killing individuals and indirectly changing resource availability and the physical environment (White and Pickett, 1985). Plant community composition and structure is responsive to changes in biotic and abiotic factors after disturbance events (White, 1979; Forman, 1995). A major role played by disturbance is the deflection of a community from a successional path (Pickett and White, 1985; Pickett, 1976). For example, burning may directly remove litter and aboveground biomass causing changes to soil nutrients, temperature and moisture (Facelli and Pickett, 1991). In a forested plant community, increases in soil temperature and loss of apical dominance may promote suckering of woody species (Maini, 1960; Ripley and Archibold, 1999), negatively affecting low-statured species through shading. However, burning in a grassland community may promote the growth of low-statured species following the removal of litter (Xiong and Nillson, 1999; Lamb, 2008). Although succession is one of the most important processes structuring ecological communities (Bazzaz, 1983; Godron and Forman, 1983; Pickett and White, 1985; Grime, 2001), no studies have examined the role of succession in shaping AORs.

Given that succession is an important factor structuring plant communities, and that cumulative anthropogenic disturbances can alter AORs (Fisher and Frank, 2004; Webb et al., 2007), we expect that AORs may change through time as a community recovers from disturbance. In this study, we examine the role of time since burning in shaping the AORs in a Fescue Grassland in Prince Albert National Park, Saskatchewan. We used a 35-year data set encompassing a range of times since prescribed burning to assess how AORs change with succession. We examined two plant communities: an open rough fescue (*Festuca hallii* (Vasey) Piper) dominated grassland and a grassland-forest transition community dominated by trembling

aspen (*Populus tremuloides* Michx.). The trends observed in AOR differ between plant communities, indicating that, while succession is important in shaping AORs, differing mechanisms of recovery suggest communities cannot be expected to react in a similar manner.

3.3 Methods

3.3.1 Study area

The study area is located in the southwest portion of Prince Albert National Park (PANP) (53°36 N, 106°31 W), approximately 50 km northwest of Prince Albert, Saskatchewan. (Fig. 2-1). The study area is within the Boreal Transition Ecoregion, but patches of the more southern Aspen Parkland Ecoregion are common (Acton et al., 1998). The Aspen Parkland Ecoregion is characterized by forest dominated by trembling aspen (*Populus tremuloides* Michx.) and other woody species interspersed with patches of Fescue Grassland (Cameron 1975,; Trottier, 1985). One representative Fescue Grassland in PANP, Wasstrom's Flats, was utilized for this study. The grassland in Wasstrom's Flats is dominated by plains rough fescue (*Festuca hallii* (Vasey) Piper) and awned wheatgrass (*Elymus trachycaulus* ssp. *subsecundus* (Link) A. Love & D. Love), while forest transition areas surrounding the grassland and in isolated patches within it are dominated by trembling aspen. An average of 452 mm precipitation occurs at the nearest weather station with long-term data (Big River, SK.; 53°50' N, 107°2' W); 329 mm as rainfall and 123 mm as snowfall (Environment Canada, 2011) (Appendix H). Soils are Orthic Black Chernozems occurring on coarse to moderately coarse textured glaciofluvial deposits (Padbury et al., 1978). Current disturbances in the study area include intermittent plains bison (*Bison bison bison* L.) and elk (*Cervus elaphus* L.) grazing and light recreational use from park visitors. Historically fire played a large role in maintaining the grassland, but fire suppression efforts beginning c.1960 have restricted fire occurrences (Cameron, 1975; Gunn et al., 1976; Trottier, 1985). Other anthropogenic influences include a vehicle trail and ploughed firebreaks that bisect the site.

3.3.2 Study design and data collection

We examined the association between succession and AORs using a 35-year data set (1975-2010) from a prescribed burn study (Gunn et al., 1976; Trottier, 1985; Kenkel, 2002). The site was initially surveyed in 1975, approximately 28 years after the previous known fire. Prescribed burns were conducted between 1975 and 1983 (Table 2-1). Plots received one of three

burn treatments: five fall burns, three fall burns or four spring burns. Due to the low number of samples in the original experiment determining individual burn treatment effects on AOR was not possible. Follow-up surveys of permanent plots were conducted in 1983, 1995, and 2010. The dataset thus captures plant community structure prior to burning in 1975, after burning in 1983, and through moderate (1995) and longer (2010) lengths of time for recovery after burning. Sampling was conducted on 16 plots containing a total of 400 permanent quadrats established in 1975. Eight plots were placed in the open grassland community and eight in the adjacent forest transition community. The forest transition community was defined as locations where trembling aspen encroachment was evident in 1975. Each plot contained 25-1 m^2 quadrats laid out in a square grid (Fig. 2-2). Cover of all vascular plant species was recorded in each quadrat during the summers of 1975, 1983, 1995 and 2010. To address potential identification issues stemming from different observers between years, it was necessary to group a small number of species to the genus level (Appendix A).

Abundance and occupancy measures for each species in each survey year were derived from the cover data, as determining the presence and absence of was possible with this data set. Abundance was the mean number of quadrats within a plot where a species was recorded. Occupancy was the number of plots where each species occurred in at least one quadrat. Abundance for each species therefore ranged from 0-25, while occupancy of each species ranged from 0-8. Occupancy data were analyzed as the proportion of plots occupied by a species. Abundance and occupancy measures were calculated separately for species occurring in grassland (n=110) and forest transition (n=118) communities. Grassland abundance and occupancy data are shown in Table 3-1, and forest transition abundance and occupancy data are shown in Table 3-2.

3.3.3 Statistical analysis

Analysis of interspecific AORs across years was carried out using generalized linear models using the glm function with a specified quasibinomial error family in the R.2.12.1 package (R Development Team, 2010) following the approach used by Buckley and Freckleton (2010). Model selection procedures (Crawley, 2007) were used to reduce a maximal model with a separate relationship for each survey period to a simplified model with common relationships for groups of surveys. If AORs differed between survey periods, then models with separate

relationships had a significantly higher explanatory power than models with common relationships. In each case, the maximal model included occupancy as the continuous response variable, abundance as a continuous explanatory variable, year as a categorical explanatory variable, and the year by abundance interaction term. Year by abundance interaction terms in the model were successively combined or finally removed until a minimally adequate (best) model was identified. The best model had a non-significant ($P \geq 0.05$) difference in explanatory power when compared to the maximal model, indicating that none of the removed terms were important in explaining variation in the response variable. A quasibinomial error family distribution was used to add an empirical scale parameter, addressing overdispersion in the preliminary model with binomial family errors specified.

Table 3-1. Grassland plant community abundance and occupancy data for each species in each survey year during the prescribed burn study in Prince Albert National Park, 1975-2010. Abundance was the mean number of quadrats within a plot where a species was recorded. Occupancy was the number of plots where each species occurred in at least one quadrat. Abundance for each species therefore ranged from 0-25, while occupancy of each species ranged from 0-8.

	Abundance				Occupancy			
Species	1975	1983	1995	2010	1975	1983	1995	2010
Achillea millefolium	15.25	18.00	17.63	22.75	8	8	8	8
Achnatherum richardsonii	1.80	3.63	1.33	6.50	5	8	3	8
Agastache foeniculum	3.50	4.50	8.00	9.29	6	6	5	7
Agoseris glauca	7.50	15.13	13.63	18.25	8	8	8	8
Agrostis scabra	5.50	13.88	13.13	13.13	8	8	8	8
Allium spp.	0.00	1.00	1.00	2.50	0	1	2	4
Amelanchier alnifolia	0.00	5.43	6.71	8.29	0	7	7	7
Amerorchis rotundifolia	0.00	3.00	1.00	1.00	0	7	3	1
Anemone canadensis	0.00	0.00	1.00	0.00	0	0	3	0
Anemone cylindrica	1.60	3.29	3.50	1.00	5	7	6	1
Anemone multifida	1.67	9.75	5.29	5.50	3	8	7	8
Antennaria spp.	4.00	5.57	4.83	6.00	3	7	6	7
Arabis hirsuta	1.00	2.00	0.00	0.00	2	2	0	0
Arctostaphylos uva-ursi	3.50	3.20	4.88	6.88	6	5	8	8
Arnica fulgens	0.00	0.00	0.00	1.67	0	0	0	6
Artemisia campestris	2.00	1.67	1.67	3.60	2	3	3	5
Artemisia frigida	1.50	1.00	1.00	1.00	2	2	1	1

Artemisia ludoviciana	4.43	4.86	4.25	5.43	7	7	8	7
Astragalus laxmannii	1.00	2.25	0.00	2.25	1	4	0	4
Betula spp.	0.00	0.00	1.00	5.00	0	0	1	1
Bromus spp.	2.00	2.00	1.00	1.00	1	4	2	2
Calamagrostis canadensis	0.00	0.00	0.00	1.33	0	0	0	3
Calamagrostis rubescens	0.00	0.00	0.00	1.00	0	0	0	2
Calamagrostis spp.	0.00	9.13	2.50	12.75	0	8	6	8
Campanula rotundifolia	13.13	17.63	11.25	17.38	8	8	8	8
Carex spp.	6.50	24.50	11.75	22.63	4	8	8	8
Cerastium arvense	0.00	9.25	1.00	1.00	0	8	2	2
Chenopodium album	0.00	0.00	1.00	0.00	0	0	1	0
Cirsium arvense	1.00	2.00	0.00	0.00	1	1	0	0
Cirsium foliosum	0.00	0.00	0.00	4.00	0	0	0	2
Coeloglossum viride	0.00	0.00	1.00	2.25	0	0	1	4
Comandra umbellata	5.29	12.75	14.75	16.13	7	8	8	8
Crepis tectorum	0.00	0.00	7.14	0.00	0	0	7	0
Danthonia intermedia	0.00	4.00	4.60	7.88	0	6	5	8
Elymus lanceolatus	0.00	0.00	0.00	4.80	0	0	0	5
Elymus spp.	19.25	23.50	24.63	23.88	8	8	8	8
Elymus villosus	4.43	10.25	6.25	3.40	7	8	8	5
Epilobium angustifolium	0.00	2.50	2.00	1.50	0	2	1	2
Erigeron spp.	8.13	14.00	5.00	15.88	8	8	8	8
Festuca brachyphylla	0.00	6.00	0.00	0.00	0	1	0	0
Festuca hallii	18.50	23.75	23.00	20.50	8	8	8	8
Festuca saximontana	0.00	2.17	3.50	7.00	0	6	6	6
Fragaria virginiana	4.17	5.50	5.71	13.88	6	6	7	8
Gaillardia aristata	0.00	2.33	1.00	1.00	0	3	1	4
Galium boreale	18.13	24.13	22.88	24.63	8	8	8	8
Galium trifidum	0.00	0.00	0.00	1.00	0	0	0	2
Gentiana affinis	0.00	2.00	1.00	1.33	0	4	1	3
Gentianella amarella	0.00	3.00	0.00	0.00	0	2	0	0
Geum aleppicum	0.00	0.00	0.00	2.00	0	0	0	6
Geum triflorum	2.83	3.00	3.00	3.20	6	4	4	5
Hedysarum alpinum	3.88	10.38	8.63	14.00	8	8	8	8
Helictotrichon hookerii	1.25	0.00	3.00	1.00	4	0	1	4
Hesperostipa spp.	3.86	8.29	6.00	8.38	7	7	8	8
Heuchera richardsonii	0.00	4.71	2.50	4.63	0	7	6	8
Hieracium spp.	0.00	7.63	2.00	9.14	0	8	1	7
Hierochloe odorata	2.25	4.00	0.00	14.00	4	4	0	7
Koeleria macrantha	10.50	24.63	8.17	9.75	8	8	6	8
Lathyrus ochroleucus	8.75	9.63	10.88	9.38	8	8	8	8
Liatris ligulistylis	0.00	0.00	0.00	1.67	0	0	0	3
Lilium philadelphicum	1.00	3.00	1.00	2.75	4	4	2	4

Lithospermum canescens	1.00	2.67	2.13	7.13	2	3	8	8
Lycopodium spp.	0.00	0.00	1.00	0.00	0	0	2	0
Maianthemum canadense	0.00	0.00	1.00	0.00	0	0	1	0
Maianthemum stellatum	4.88	5.43	6.00	9.63	8	7	8	8
Monarda fistulosa	1.00	0.00	0.00	0.00	1	0	0	0
Muhlenbergia racemosa	0.00	1.50	1.00	0.00	0	4	1	0
Muhlenbergia spp.	0.00	2.33	0.00	1.60	0	3	0	5
Mulgedium oblongifolium	3.00	1.00	0.00	0.00	3	1	0	0
Orthilia secunda	1.50	0.00	0.00	0.00	2	0	0	0
Orthocarpus luteus	0.00	9.00	1.80	2.00	0	6	5	6
Oryzopsis spp.	0.00	0.00	4.25	1.50	0	0	8	2
Oxytropis campestris	2.86	6.38	6.13	4.00	7	8	8	7
Pascopyrum smithii	0.00	0.00	0.00	4.80	0	0	0	5
Picea glauca	0.00	0.00	0.00	1.33	0	0	0	3
Pinus banksiana	0.00	2.00	1.50	3.00	0	1	2	2
Poa spp.	4.88	2.17	2.00	1.50	8	6	6	2
Poaceae unknown	0.00	0.00	2.00	0.00	0	0	1	0
Polygala senega	1.25	10.14	6.50	15.88	4	7	8	8
Populus balsamifera	0.00	0.00	1.67	0.00	0	0	3	0
Populus tremuloides	4.57	3.83	1.50	5.63	7	6	4	8
Potentilla arguta	1.00	3.40	3.33	12.00	4	5	6	7
Potentilla pensylvanica	1.00	2.00	0.00	1.00	1	2	0	3
Prenanthes racemosa	0.00	0.00	0.00	1.00	0	0	0	2
Prunus virginiana	0.00	0.00	0.00	1.00	0	0	0	1
Pulsatilla patens	0.00	1.67	0.00	3.86	0	6	0	7
Pyrola asarifolia	0.00	0.00	0.00	1.00	0	0	0	1
Rosa acicularis	8.00	10.63	11.50	15.88	8	8	8	8
Salix bebbiana	0.00	0.00	1.00	1.33	0	0	3	3
Schizachne purpurascens	0.00	1.75	2.50	1.67	0	4	2	3
Selaginella densa	0.00	0.00	1.00	6.50	0	0	1	6
Silene drummondii	0.00	0.00	1.00	0.00	0	0	1	0
Sisyrinchium montanum	5.25	10.67	3.88	18.63	8	6	8	8
Solidago canadensis	0.00	3.00	2.80	2.67	0	3	5	6
Solidago missouriensis	9.25	23.38	0.00	21.25	8	8	0	8
Solidago nemoralis	0.00	0.00	0.00	1.00	0	0	0	1
Solidago rigida	1.50	7.00	0.00	1.50	2	1	0	4
Solidago spathulata	0.00	0.00	21.00	8.00	0	0	8	1
Sonchus spp.	4.71	0.00	0.00	0.00	7	0	0	0
Spiranthes romanzoffiana	0.00	0.00	0.00	1.00	0	0	0	2
Stellaria longifolia	1.67	4.63	1.80	0.00	3	8	5	0
Symphoricarpos occidentalis	10.83	14.20	8.17	11.00	6	5	6	6
Symphyotrichum ciliolatum	0.00	0.00	1.00	1.67	0	0	1	3
Symphyotrichum laeve	7.63	10.88	13.88	17.75	8	8	8	8

Taraxacum officinale	1.00	0.00	1.50	4.50	4	0	2	8
Thalictrum venulosum	15.63	18.00	20.00	22.38	8	8	8	8
Vaccinium caespitosum	6.00	6.00	0.00	0.00	1	1	0	0
Vicia americana	19.38	15.00	16.50	22.38	8	8	8	8
Viola adunca	4.25	19.13	13.38	19.25	8	8	8	8
Zizia aptera	2.00	2.00	2.00	5.38	1	2	3	8
Zygadenus elegans	3.33	1.00	2.00	4.00	3	3	3	4

Table 3-2. Forest transition plant community abundance and occupancy data for each species in each survey year during the prescribed burn study in Prince Albert National Park, 1975-2010. Abundance was the mean number of quadrats within a plot where a species was recorded. Occupancy was the number of plots where each species occurred in at least one quadrat. Abundance for each species therefore ranged from 0-25, while occupancy of each species ranged from 0-8.

	Abundance				Occupancy			
Species	1975	1983	1995	2010	1975	1983	1995	2010
Achillea millefolium	13.50	19.00	16.00	17.63	8	8	8	8
Achnatherum richardsonii	1.67	4.57	1.50	2.14	3	7	2	7
Agastache foeniculum	1.86	2.50	2.38	4.00	7	8	8	8
Agoseris glauca	5.38	8.50	7.13	6.00	8	8	8	8
Agrostis scabra	5.50	6.63	4.71	3.50	8	8	7	6
Allium spp.	1.00	0.00	1.50	4.00	1	0	2	1
Amelanchier alnifolia	0.00	5.50	7.13	7.63	0	8	8	8
Amerorchis rotundifolia	0.00	2.14	1.00	0.00	0	7	2	0
Androsace septentrionalis	0.00	0.00	2.00	5.00	0	0	1	2
Anemone canadensis	0.00	0.00	1.00	0.00	0	0	2	0
Anemone cylindrica	1.20	3.50	2.75	0.00	5	6	4	0
Anemone multifida	2.33	3.57	5.00	2.63	3	7	6	8
Antennaria spp.	1.00	2.50	1.33	2.00	1	8	6	6
Arabis hirsuta	0.00	1.00	0.00	1.00	0	1	0	1
Arctostaphylos uva-ursi	5.25	6.29	8.63	8.13	8	7	8	8
Arnica fulgens	0.00	0.00	0.00	1.00	0	0	0	1
Artemisia campestris	0.00	2.00	1.00	1.00	0	1	1	2
Artemisia ludoviciana	3.00	3.75	2.20	3.50	4	4	5	4
Astragalus laxmannii	0.00	3.00	1.00	0.00	0	1	1	0
Betula spp.	2.33	3.67	4.33	6.00	3	3	3	3
Botrychium virginianum	0.00	0.00	0.00	1.00	0	0	0	1
Bromus inermis	0.00	0.00	0.00	2.00	0	0	0	1

Bromus spp.	10.33	4.00	2.57	5.86	6	7	7	7
Calamagrostis spp.	0.00	14.63	1.50	13.13	0	8	8	8
Calamagrostis canadensis	0.00	0.00	0.00	2.67	0	0	0	3
Calamagrostis rubescens	0.00	0.00	0.00	1.00	0	0	0	1
Campanula rotundifolia	7.88	13.00	9.38	11.25	8	8	8	8
Carex spp.	3.29	24.38	9.00	17.88	7	8	7	8
Castilleja miniata	0.00	0.00	0.00	1.00	0	0	0	1
Cerastium arvense	0.00	4.75	1.00	1.00	0	8	1	1
Cirsium arvense	0.00	0.00	1.00	0.00	0	0	1	0
Cirsium foliosum	0.00	0.00	1.00	1.00	0	0	1	3
Coeloglossum viride	0.00	1.00	1.00	2.33	0	2	1	3
Comandra umbellata	5.71	14.43	9.25	6.57	7	7	8	7
Cornus canadensis	1.00	1.00	0.00	1.00	1	1	0	1
Corylus cornuta	0.00	0.00	0.00	2.00	0	0	0	2
Crepis tectorum	0.00	0.00	4.88	0.00	0	0	8	0
Danthonia intermedia	0.00	3.33	1.57	1.83	0	6	7	6
Elymus spp.	15.63	23.25	18.75	17.38	8	8	8	8
Elymus villosus	4.25	16.63	13.38	15.13	8	8	8	8
Epilobium angustifolium	0.00	3.57	1.88	3.71	0	7	8	7
Erigeron spp.	3.63	6.00	3.38	5.63	8	8	8	8
Festuca hallii	8.88	16.50	16.25	14.13	8	8	8	8
Festuca saximontana	0.00	3.25	1.00	2.25	0	4	2	4
Fragaria virginiana	10.25	13.38	10.63	16.88	8	8	8	8
Gaillardia aristata	0.00	1.00	0.00	1.00	0	2	0	3
Galium boreale	19.00	24.63	22.63	23.75	8	8	8	8
Gentiana affinis	0.00	7.00	1.00	1.00	0	8	1	2
Geum aleppicum	0.00	0.00	0.00	1.25	0	0	0	4
Geum triflorum	1.60	2.00	2.00	1.50	5	3	2	4
Hedysarum alpinum	4.75	12.75	8.63	11.88	8	8	8	8
Helictotrichon hookerii	1.50	0.00	1.00	3.50	4	0	1	6
Hesperostipa spp.	5.83	5.00	4.33	3.17	6	5	3	6
Heterotheca villosa	0.00	0.00	1.00	0.00	0	0	1	0
Heuchera richardsonii	2.00	4.63	3.43	3.88	6	8	7	8
Hieracium spp.	0.00	6.63	0.00	7.13	0	8	0	8
Hierochloe odorata	2.67	2.50	1.00	5.75	3	4	1	8
Koeleria macrantha	4.29	19.63	4.67	2.33	7	8	6	6
Lathyrus ochroleucus	10.88	16.13	16.25	19.63	8	8	8	8
Lathyrus venosus	0.00	0.00	0.00	1.00	0	0	0	1
Liatris ligulistylis	0.00	1.00	0.00	1.67	0	1	0	3
Lilium philadelphicum	1.67	1.00	1.00	1.60	3	5	3	5
Lithospermum canescens	1.67	3.14	2.29	6.25	3	7	7	8
Lonicera dioica	0.00	1.00	1.00	2.50	0	2	2	2
Lycopodium spp.	0.00	0.00	1.50	1.00	0	0	2	1

Lysimachia ciliata	0.00	0.00	1.00	0.00	0	0	1	0
Maianthemum canadense	4.00	5.50	3.00	3.75	3	2	3	4
Maianthemum stellatum	6.67	7.86	6.63	11.38	6	7	8	8
Mitella nuda	0.00	0.00	0.00	1.00	0	0	0	1
Muhlenbergia racemosa	0.00	2.50	0.00	0.00	0	4	0	0
Muhlenbergia spp.	0.00	0.00	0.00	2.00	0	0	0	3
Mulgedium oblongifolium	1.00	0.00	0.00	0.00	1	0	0	0
Orthocarpus luteus	0.00	2.71	1.50	2.33	0	7	4	3
Oryzopsis spp.	2.00	2.00	2.60	2.60	1	5	5	5
Oxytropis campestris	3.17	5.75	6.00	2.50	6	8	7	6
Pascopyrum smithii	0.00	0.00	0.00	1.00	0	0	0	1
Picea glauca	0.00	0.00	0.00	1.00	0	0	0	1
Pinus banksiana	0.00	1.00	5.00	3.00	0	1	1	3
Poa spp.	2.14	2.33	5.17	0.00	7	6	6	0
Polygala senega	0.00	12.88	6.57	9.25	0	8	7	8
Populus balsamifera	0.00	0.00	1.29	0.00	0	0	7	0
Populus tremuloides	13.13	17.88	8.25	21.13	8	8	8	8
Potentilla arguta	2.50	2.88	2.17	4.00	2	8	6	8
Potentilla pensylvanica	0.00	1.50	0.00	1.00	0	2	0	1
Prenanthes racemosa	0.00	0.00	0.00	1.00	0	0	0	1
Prunus virginiana	1.50	0.00	0.00	0.00	2	0	0	0
Pulsatilla patens	0.00	4.00	0.00	2.00	0	1	0	5
Pyrola asarifolia	1.00	4.00	2.75	1.00	1	1	4	2
Ribes oxyacanthoides	0.00	0.00	1.67	0.00	0	0	3	0
Rosa acicularis	12.50	17.25	19.13	20.38	8	8	8	8
Rubus pubescens	3.00	1.50	0.00	0.00	1	2	0	0
Rubus spp.	0.00	2.00	0.00	3.00	0	1	0	4
Salix bebbiana	2.33	1.80	2.67	3.00	3	5	3	8
Schizachne purpurascens	0.00	5.13	2.86	3.50	0	8	7	6
Selaginella densa	0.00	0.00	0.00	2.00	0	0	0	3
Shepherdia canadensis	0.00	3.00	1.00	2.50	0	1	2	2
Silene drummondii	0.00	0.00	1.00	0.00	0	0	1	0
Sisyrinchium montanum	2.00	5.00	10.86	3.75	2	8	7	8
Solidago canadensis	1.00	6.29	5.71	8.86	1	7	7	7
Solidago missouriensis	8.13	19.00	1.75	9.50	8	8	4	8
Solidago rigida	5.71	1.50	1.00	2.00	7	2	1	2
Solidago spathulata	0.00	0.00	13.63	2.00	0	0	8	3
Sonchus spp.	2.67	1.00	0.00	0.00	6	3	0	0
Spiranthes romanzoffiana	0.00	0.00	0.00	1.00	0	0	0	1
Stellaria longifolia	0.00	2.14	2.33	0.00	0	7	3	0
Symphoricarpos occidentalis	6.14	10.33	9.17	11.33	7	6	6	6
Symphyotrichum ciliolatum	0.00	3.33	3.00	3.60	0	3	4	5
Symphyotrichum laeve	12.75	15.75	17.50	19.88	8	8	8	8

Taraxacum officinale	1.71	3.00	2.00	6.25	7	2	5	8
Thalictrum venulosum	15.00	18.75	20.00	21.75	8	8	8	8
Trifolium pratense	0.00	0.00	0.00	1.00	0	0	0	1
Trifolium repens	0.00	0.00	0.00	1.00	0	0	0	1
Vaccinium caespitosum	0.00	2.67	1.00	1.00	0	3	2	2
Vaccinium myrtilloides	0.00	0.00	0.00	1.00	0	0	0	1
Vicia americana	14.75	19.88	18.38	18.38	8	8	8	8
Viola adunca	7.63	20.50	14.50	20.75	8	8	8	8
Zizia aptera	1.00	2.86	3.00	2.14	1	7	3	7
Zygadenus elegans	2.71	2.33	1.00	3.67	7	3	1	3

3.4 Results

Grassland AORs differed between years as the final model (Fig. 3-1) included the continuous explanatory variable abundance ($F=442.51$, $P<0.001$), the categorical explanatory variable year (reduced to two factors: combined 1975 and 1995, and combined 1983 and 2010) ($F=0.131$, $P=0.717$), and the year by abundance interaction term ($F=9.547$, $P=0.002$). The final grassland model showed 1983 and 2010 abundance increased relative to occupancy compared to 1975 and 1995, and was not significantly different than the maximal model ($F_{4, 436}=0.3759$, $P=0.8258$). In contrast, forest transition AORs were not significantly different between survey periods with different lengths of time since burning (Fig. 3-1). Forest transition AORs did not differ between years as the final model included the continuous explanatory variable abundance ($F=208.06$, $P<0.001$), but no year or year by abundance interaction terms. The final forest transition model was not significantly different than the maximal model ($F_{6, 470}=0.283$, $P=0.945$). Mean abundance and occupancy of species during the 1975, 1983, 1995 and 2010 surveys are shown in Table 3-3.

Table 3-3. Mean abundance and occupancy of all species in the grassland and forest transition plots during the prescribed burn study in Prince Albert National Park 1975-2010. Abundance was the mean number of quadrats within a plot where a species was recorded. Occupancy was the number of plots where each species occurred in at least one quadrat. The mean abundance and occupancy ± 1 standard deviation is provided in each plant community column.

	Grassland		Forest Transition	
Year	Abundance	Occupancy	Abundance	Occupancy
1975	2.88 ± 4.57	2.83 ± 3.29	2.60 ± 4.14	2.68 ± 3.29
1983	5.22 ± 6.63	3.79 ± 3.32	4.97 ± 6.46	3.96 ± 3.42
1995	4.12 ± 5.74	3.58 ± 3.29	3.85 ± 5.30	3.58 ± 3.25
2010	6.11 ± 6.94	4.48 ± 3.12	4.78 ± 5.99	4.12 ± 3.14

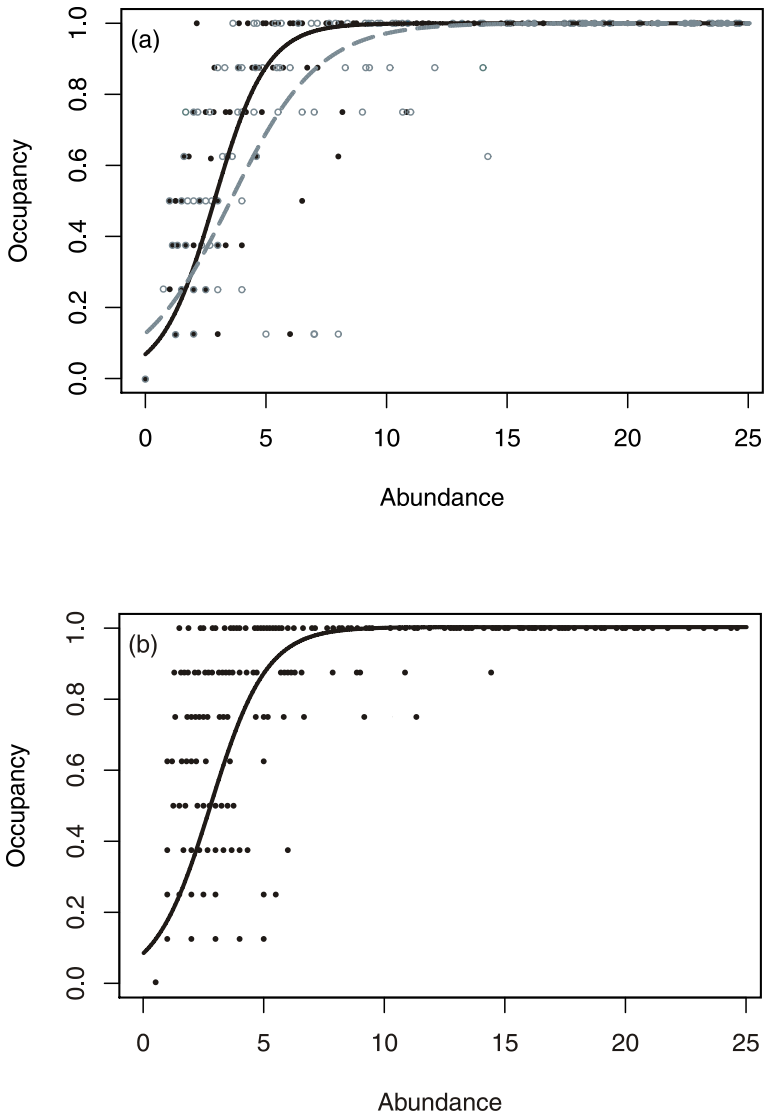

Figure 3-1. Interspecific abundance – occupancy relationships (AOR) observed in the grassland (a) and forest transition (b) plant communities. Abundance is the mean number of quadrats where a species occurred in each plot. Occupancy is the mean number of plots where a species occurred. Grassland plant community (n=110) AORs varied significantly over the study period, where 1983 and 2010 data showed a similar relationship of increased abundance relative to occupancy compared to 1975 and 1995 data. Species abundance and occupancy data from 1975 and 1995 is shown by filled black circles and data from 1983 and 2010 is shown by open grey circles. The interspecific AOR for the grouped 1975 and 1995 data is shown by the black line and the AOR for the grouped 1983 and 2010 data is shown by the dotted grey line. Forest transition plant community (n=118) AORs were not significantly different across survey periods with varying time since fire. Species abundance and occupancy for all years is shown by filled black circles. The interspecific AOR is shown by the black line.

3.5 Discussion

As is generally observed in ecological communities, positive relationships between abundance and occupancy occurred in the grassland and forest transition communities (Gaston and Lawton, 1990; Gaston, 1994). The shape of the AOR, however, varied between and within the plant communities. The AOR changed through time in the grassland community, where the abundance of species in the 1983 and 2010 surveys increased relative to occupancy, and was higher than that observed during the 1975 and 1995 surveys. No changes in the AOR were observed in the forest transition community, demonstrating that temporal changes in AORs can vary considerably between communities.

Few studies have examined the potential affect of disturbance and subsequent plant community restructuring in altering AORs. Webb et al. (2007) showed that continual agricultural intensification and habitat modification altered AORs of farmland and woodland birds, with changes to the intraspecific AOR of rare and declining species ultimately driving the form of the community-wide interspecific AOR. Ongoing anthropogenic disturbance can also influence interspecific AORs in marine fish species (Fisher and Frank, 2004). These studies, however, examined gradual modifications from external pressures rather than a disturbance recovery scenario within a community highly adapted to respond to disturbance such as burning. Compounding the knowledge gap of the succession plays in shaping AORs, few studies have incorporated a sampling period that captures long-term community changes. Stability of AORs through time has been reported, however determining why this stability occurs has not been explored (Buckley and Freckleton, 2010). Succession likely plays a role in these trends in AOR; however, this has been overlooked as a mechanism shaping AORs. This oversight may be because the effects of disturbance, for example the removal of litter with burning, are not exclusive of better studied mechanisms such as resource availability. Disturbance may have also been viewed as a source of noise that could confound or unnecessarily complicate a study. In an effort to control this noise, sites and systems unaffected by disturbance events during the study may have been preferentially chosen (Gotelli and Simberloff, 1987). As a result, the patterns observed in AOR would be less likely to change due to succession, allowing causation to be attributed to other mechanisms. On the other hand, large datasets including sites under varying management and disturbance regimes may have been used without critically assessing if AORs differ among them (Collins and Glenn, 1990; Buckley and Freckleton, 2010).

Changes to the AOR of a given plant community are likely shaped by the autecology of species, and mechanisms involved with plant community restructuring after disturbance. Grassland community AORs change through time, with the driving mechanism likely interactions between burning, litter cover and soil resources. The removal of litter with burning may cause changes to soil resources and microclimate, altering environmental conditions that negatively may effect species, but also creating space for the establishment of an increased number of individuals of some species, or may permit an increase in the growth and cover of plants that were already established. Short-statured graminoids and forbs that may have been suppressed by large amounts of litter including *Carex* spp., *Koeleria macrantha* (Ledeb.) J.A. Schultes, *Agrostis scabra* Willd., *Viola adunca* Sm., *Cerastium arvense* L., *Orthocarpus luteus* Nutt. and *Polygala senega* L. showed large increases in abundance relative to occupancy between 1975 and 1983. A decrease in abundance relative to occupancy between 1983 and 1995 was observed in low-statured species including *Koeleria macrantha*, *Orthocarpus luteus*, *Cerastium arvense*, and *Carex* spp. that had initially increased after burning, and may be due to recovery of litter with time since burning. An increase in abundance relative to occupancy between 1995 and 2010 was driven by relatively tall species including *Hierochloe odorata* (L.) Beauv. and *Potentilla arguta* Pursh, species with erect growth forms such as *Sisyrinchium montanum* Greene, and highly plastic species such as *Fragaria virginiana* Duchesne (Table 2-4). These species may have been able to grow through high amounts of litter and exploit soil water to increase abundance, as 2010 growing season precipitation was 135% (407 mm) of average (301 mm) (Appendix H). It is also important to note the changes in *Solidago* species abundance and occupancy across years (Table 2-4). These changes are potentially the result of misidentification in the 1995 survey. Adhering to criteria that allowed a consistent treatment of the dataset, *Solidago* species were kept separate as the raw data suggested that surveyors in all years were able to identify the species correctly (see species grouping table in Appendix A). The patterns observed in grassland AORs remained unchanged even when *Solidago* species were grouped, demonstrating these responses are robust to a substantial degree of variation in the data.

In contrast to the grassland community, the AOR in the forest transition community did not change with time since disturbance. While burning likely had similar effects on litter and soil resources in the forest transition community as in the grassland, such effects likely had a much shorter-lived influence relative to the rapid response of the dominant tree species, trembling

aspen, to burning. Trembling aspen regenerates vigorously from vegetive root suckering following fire, allowing it to quickly regain dominance (Maini, 1960; Mueggler, 1989; Keyser et al., 2005). Burning may create a shorter-lived window for change in species abundance and occupancy in the forest transition compared with the grassland community, which may have been missed between the last burn in 1982 and the post-fire survey in 1983.

Table 3-4. Species with the largest changes in abundance between survey periods of the prescribed burn study in Prince Albert National Park, 1975-2010. Changes in abundance of species between survey periods is shown by ΔA, and changes in species occupancy between survey periods is shown by ΔO. Descriptions of species growth forms are also given. For a full list of species changes in abundance and occupancy through time see Appendix H.

Period	Species	Δ A	Δ O	Description
1975-	*Carex* spp.	+18.00	+4	Short perennial rhizomatous sedge
1983	*Viola adunca*	+14.88	0	Short rhizomatous forb
	Koeleria macarantha	+14.13	0	Short tufted perennial grass
	Solidago missouriensis	+14.13	0	Short perennial forb, extensive rhizomes
	Cerastium arvense	+9.25	+8	Low growing caespitose perennial forb
	Calamagrostis spp.	+9.13	+8	Perennial rhizomatous grass, variable growth
	Orthocarpus luteus	+9.00	+6	Erect short annual forb
	Polygala senega	+8.89	+3	Short perennial forb, branches from taproot
	Agrostis scabra	+8.38	0	Short tufted perennial grass with fibrous roots
	Anemone multifida	+8.08	+5	Tufted perennial forb, stems from caudex
1983-	*Solidago missouriensis*	-23.38	-8	Short perennial forb, extensive rhizomes
1995	*Solidago spathulata*	+21.00	+8	Short perennial forb, extensive rhizomes
	Koeleria macarantha	-16.46	-2	Short tufted perennial grass
	Carex spp.	-12.75	0	Short perennial rhizomatous sedge
	Erigeron spp.	-9.00	0	Short perennial forb, caudex and fibrous roots
	Cerastium arvense	-8.25	-6	Low growing caespitose perennial forb
	Orthocarpus luteus	-7.20	-1	Erect short annual forb
	Crepis tectorum	+7.14	+7	Tall taprooted annual, introduced invader
	Solidago rigida	-7.00	-1	Tall perennial forb, fibrous roots
	Sisyrinchium montanum	-6.79	+2	Erect short perennial forb with fibrous roots
1995-	*Solidago missouriensis*	+21.25	+8	Short perennial forb, extensive rhizomes
2010	*Sisyrinchium montanum*	+14.75	0	Erect short perennial forb with fibrous roots
	Hierochloe odorata	+14.00	+7	Tall perennial rhizomatous grass
	Solidago spathulata	-13.00	-7	Short perennial forb, extensive rhizomes
	Erigeron spp.	+10.88	0	Short perennial forb, caudex and fibrous roots
	Carex spp.	+10.88	0	Short perennial rhizomatous sedge
	Calamagrostis spp.	+10.25	+2	Perennial rhizomatous grass, variable growth
	Polygala senega	+9.38	0	Short perennial forb, branches from taproot
	Potentilla arguta	+8.67	+1	Tall rhizomatous perennial forb
	Fragaria virginiana	+8.17	+1	Rhizomatous perennial forb with stolons

3.6 Conclusion

Positive AORs were observed through time since burning in both grassland and forest transition plant communities. Succession did not alter the overall positive relationship generally seen with AORs, but clearly AORs are dynamic within communities and regularly change over time with recovery from disturbance events. We expect that succession is a contributing mechanism shaping AORs in many plant communities. Further, given that ongoing disturbance is known to change AORs in fish and songbird populations, recovery after disturbance is likely an important mechanism shaping AORs across taxa (Fisher and Frank, 2004; Webb et al., 2007).

3.7 References

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Chapter 4 preamble

The previous chapter uncovered differences in abundance-occupancy relationships (AOR) within and between plant communities over time since burning. Grassland AORs show variability through time, where adjacent forest transition communities (areas where aspen encroachment was evident prior to carrying out prescribed burns) have stable AORs through time. The difference in AOR between plant communities may indicate increasing dominance by woody species such as trembling aspen in the forest transition. The difference in AOR between communities may also indicate trembling aspen encroachment has occurred despite prescribed burning, and further threatens remaining Fescue Grassland.

In this chapter, changes in density and cover of trembling aspen over time since prescribed burning are assessed to determine if encroachment has occurred. Differing season and number of prescribed burn treatments were assessed to determine which, if any, were effective in suppressing trembling aspen encroachment in the Fescue Grassland. General increases in trembling aspen cover over time in forest transition and grassland plant communities suggest none of the prescribed burn treatments were effective in suppressing the tree. Changes to the management of these Fescue Grasslands that include secondary control of trembling aspen suckering after burning is needed if encroachment is to be suppressed. Encouraging interactions between fire and grazing may be useful in providing encroachment control in way that emulates natural disturbance processes in these Fescue Grasslands.

This chapter relates to the overall thesis by addressing the study objectives: to assess changes in plant community structure in the Fescue Grasslands of PANP over time since prescribed burning, and to assess risk from trembling aspen encroachment associated with these changes. Specifically, the utility of different prescribed burning treatments in suppressing trembling aspen were assessed by determining change in density and cover of trembling aspen through time.

4.0 Prescribed burning is not effective in controlling trembling aspen encroachment of remnant Fescue Grasslands

4.1 Abstract

Encroachment of grassland by woody species is a widespread issue across the Northern Great Plains, and is a serious management issue in remnant Fescue Prairies at the aspen parkland – boreal forest ecotone. Fire suppression is thought to encourage encroachment; however, prescribed burning as a means of controlling encroachment has had variable success. The objective of this study was to determine the effects of different season of burn, number of burns and year after burning treatments on trembling aspen (*Populus tremuloides* Michx.) encroachment in the Fescue Grasslands within Prince Albert National Park, Saskatchewan. Temporal changes in density and cover of trembling aspen in grassland and grassland-forest transition plant communities were evaluated using data from a prescribed burn study conducted in Prince Albert National Park. The effect of year and the spring burning by year interaction on trembling aspen density reflects a stimulatory effect of burning on trembling aspen suckering. Increased trembling aspen cover with more burns, fall burning, and the year by number of burns interaction in the forest transition community and year in the grassland community indicates none of the treatments were effective in controlling trembling aspen encroachment. Ongoing trembling aspen encroachment despite prescribed burning may be due to important missing interactions between fire and grazing. A shift in management practices is needed to achieve a goal of suppressing trembling aspen encroachment in these Fescue Grasslands.

4.2 Introduction

Encroachment of woody species into grasslands is a significant ecological and rangeland management issue in the Northern Great Plains, and is of particular concern in the Fescue Prairie (Moss and Campbell, 1947; Maini, 1960; Blood, 1966; Bailey and Wroe, 1974; Cameron, 1975; Fuller and Anderson, 1993). Encroachment by species such as trembling aspen (*Populus*

tremuloides Michx.) can threaten habitat and biodiversity through a reduction in grassland area, isolation and fragmentation of patches, and reduced connectivity and genetic flow between patches (Fu et al., 2008; Watkinson and Ormed, 2001). Due to agriculture and urbanization only 6% of the Fescue Prairie remains in Saskatchewan, much of which small remnant patches less than 65 ha in size (Looman, 1969; Cameron, 1975; Bailey and Anderson, 1978; Gerry and Anderson, 2002). In addition to the loss of area, historic fire regimes have been altered (Cameron, 1975; Trottier, 1985; Weir, 1996). In the Fescue Grasslands found in Prince Albert National Park (PANP) the historic fire return interval that once ranged 15-40yr is now greatly exceeded (Weir, 1996). Modified fire return interval is due to the lack of connective landscape linking these Fescue Grasslands, the low probability of large scale fires in what is now a largely agricultural landscape, and fire suppression in PANP that began c.1960. Substantial trembling aspen encroachment occurred during the fire suppression period. Between 1947 and 1995 the size of Fescue Grasslands in PANP decreased 75%, and continued shrinkage is considered likely (Parks Canada, 2011). Although the Fescue Grasslands in PANP constitute only a fraction of the remaining Fescue Prairie in Saskatchewan, they are of particular conservation interest, and effective strategies to control trembling aspen encroachment in these grasslands are urgently needed (Gerry and Andersen, 2002; Fu et al., 2008; Parks Canada, 2011).

Woody species encroachment of grasslands is thought to be controlled by interactions between climate, fire, and herbivory (Bailey and Wroe, 1974; Campbell et al., 1994; Bork et al., 1997; Ripley and Archibold, 1999). Conflicting evidence pertaining to the role of climate suggests trembling aspen encroaches under moist conditions and lack of burning, but also under dry conditions, high temperatures and frequent burn events (Maini, 1960; Bailey and Wroe, 1974; Cameron, 1975; Wilson, 1998). Periods of drought affect the probability of fire, which is an important component in the natural disturbance regime of the Fescue Prairie.

Burning can occur at any time of the year in the Fescue Prairie given adequately dry conditions; however it is more likely during spring or fall (Bailey and Anderson, 1978; Romo, 2003). Snowmelt, followed by low precipitation in the early growing season prior to bud break, provides conditions for burning given adequately dry and abundant fuel loads. Fall burns are also likely as vegetation senescence and litter in the fall provides dry and abundant fuel. When fire occurs, it removes litter and aboveground biomass causing changes to soil nutrients, temperature

and soil water content, and loss of apical dominance that promotes suckering of many woody species (Maini, 1960; Facelli and Pickett, 1991; Ripley and Archibold, 1999). Suppressing fire can alter grassland plant community structure through the development of a litter layer that excludes many low-statured species in favour of taller woody species (Anderson and Bailey, 1980; Lamb, 2008). Timing of burning is important in determining its potential effectiveness in suppressing encroachment. For example, removal of litter and aboveground structures with spring burning may increase soil temperatures and promote earlier growth and suckering of trembling aspen, thereby increasing its density (Maini, 1960; Fraser et al., 2002). The number of burns is also important, as plants exposed to re-occurring stress may not fully recover between disturbance events (Chapin et al., 1990; Bellingham and Sparrow, 2000). Mortality may be higher in plants subjected to more burns thus slowing or stopping encroachment. Alternatively, if woody plants recover between burns, more frequent fires may actually increase growth and promote encroachment.

Suppressing trembling aspen encroachment after burning relies on initial and follow-up control methods, such as grazing, to control suckering after fire (Bailey et al., 1990). Grazing is an important component of the natural disturbance regime in the Fescue Prairie. Prior to the loss of the plains bison (*Bison bison bison* L.) c.1870, an estimated 30-60 million roamed the Northern Great Plains (Soper, 1941; Knaap and Seastedt, 1986). Plains bison and other large mammals such as elk (*Cervus elaphus* L.) historically played a fundamental role in inhibiting encroachment through browsing, grazing, wallowing and trampling (Campbell et al., 1994). With the extirpation and displacement of these species, the heterogeneous grazing patterns under which the Fescue Prairie evolved, and its overall disturbance regime has been altered.

Ambiguity of the effect of climate on encroachment may be due to interacting factors of climate, fire and grazing (Campbell et al., 1994; Frey et al., 2003). Fire regime played an important role in determining areas utilized by plains bison, as a flush of comparatively palatable forage after burning increased selectivity of newly burned areas (Knaap and Seastedt, 1986). In the Fescue Grasslands in PANP, fire and grazing pressure would likely increase sucker mortality through focal browsing and trampling. Although modification of historic fire regimes and the loss of plains bison generally preclude this natural form of encroachment control, it provides a template for management.

Prescribed burning has been widely used to address encroachment and restore grasslands, but has met with variable success (Bailey et al. 1990; Bork et al., 1996; Romo, 2003; Heisler et al., 2004; Burkinshaw and Bork, 2009). Number and season of burns are important factors in controlling encroachment, however a uniform burn prescription cannot be relied upon as the effect of burning varies between sites (Pylypec and Romo, 2003; Romo, 2003). It is important to determine how encroachment in a given area is affected by prescribed burn treatments such as number and season of burns to better focus encroachment control efforts. Investigating the long-term effectiveness of prescribed burning is also needed to determine if, and for how long, encroachment is suppressed.

To determine the effectiveness of number of burns and season of burning in controlling trembling aspen encroachment, we examined density and cover of the tree in the Fescue Grasslands of Prince Albert National Park. We examined three, four and five burns within an eight year period, and spring and fall burning. We used a 35-year dataset allowing 1975 pre-burn, 1983 post-burn, 1995 burn recovery and 2010 burn recovery comparisons to assess how density and cover of trembling aspen changed through time with different prescribed burn treatments. General increases in trembling aspen cover over time indicate none of the prescribed burn treatments were effective in suppressing encroachment of the tree.

4.3 Methods

4.3.1. Study area

The study area is located in the southwest portion of Prince Albert National Park (PANP) (53°36 N, 106° 31 W), approximately 50 km northwest of Prince Albert, Saskatchewan. The study area lies within the Boreal Transition Ecoregion, but patches of the more southern Aspen Parkland Ecoregion are common (Acton et al., 1998). The Aspen Parkland Ecoregion is characterized by forest dominated by trembling aspen (*Populus tremuloides* Michx.) interspersed with patches of Fescue Grassland. Three areas of Fescue Grassland in PANP were utilized during this study; Wasstrom's Flats, Sugar Creek and Rabbit Creek. Grasslands within these patches are dominated by plains rough fescue (*Festuca hallii* (Vasey) Piper) and awned wheatgrass (*Elymus trachycaulus* ssp. *subsecundus* (Link) A. Love & D. Love), while forest transition areas surrounding the grassland and in isolated pockets within the grasslands are

dominated by trembling aspen. An average of 452 mm precipitation occurs on the site annually; 329 mm as rainfall and 123 mm as snowfall (Environment Canada, 2011) (Appendix H). Soils are Orthic Black Chernozems occurring on coarse to moderately coarse textured glaciofluvial deposits (Padbury et al., 1978). Current disturbances in the study area include intermittent grazing by plains bison and elk, and light recreational use from park visitors. Other anthropogenic influences include a vehicle trail and ploughed firebreaks that bisect the sites.

4.3.2 Study design and data collection

The effect of prescribed burning on trembling aspen density and cover were examined in grassland and grassland-forest transition (forest transition) communities using a 35-year data set (1975-2010) (Gunn et al., 1976; Trottier, 1985; Kenkel, 2002). The site was initially surveyed in 1975, approximately 28 years after the previous known large-scale fire. Burn treatments including season of burn (spring and fall) and number of burns (three, four and five) and were applied between 1976 and 1982 (Table 2-1) in an incomplete factorial design (only the four burn treatment was conducted in the spring). Follow-up surveys were conducted in 1983, 1995, and 2010. The resulting dataset captures trembling aspen density and cover prior to burning in 1975, after burning in 1983, through a moderate length of recovery in 1995, and through a longer length of recovery in 2010. Prescribed burns separate from the current study were conducted on the Sugar Creek site in 2006 and 2009. As density and cover data from the 2010 Sugar Creek survey would not reflect the original study design, it was excluded from the analysis. The control plots were also excluded from the analysis as they did not receive any of the burn treatments.

Sampling was conducted on 550 permanent quadrats set within 22 plots (12 in the forest transition community and 10 in the grassland community) (Fig. 2-1). The forest transition community was defined as locations where trembling aspen encroachment was evident in 1975, while grasslands were open and relatively free of encroachment. Each plot contained 25 quadrats laid out in a square grid (Fig. 2-2). For plots within the forest transition community, a 2 m^2 quadrat was used to enumerate stems and clumps of trembling aspen, saskatoon (*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roemer), chokecherry (*Prunus virginiana* L.), bog birch (*Betula pumila* var. *glandulifera* Regel) and Bebb's willow (*Salix bebbiana* Sarg.), and a 1 m^2 quadrat was used to collect cover of these species. Cover classes of each woody species (1- 1-10%, 2- 11-20% ... 10- 91-100%) were recorded in the 1 m^2 quadrats in1975, 1983 and 1995. Percent

cover was recorded in 2010 and converted to cover class for uniform treatment of data from all survey years. Mid-point averages of each cover class (1- 5%, 2- 15%... 10- 95%) were calculated, and the mean cover of trembling aspen in each plot was used in the cover analysis (Table 4-1). Similarly, mean density of trembling aspen in each plot was used in the density analysis (Table 4-2). Trembling aspen is the only species considered in this study as trembling aspen encroachment is the primary management concern on the site, and the original study was designed to focus on this tree. Plots were established in areas of known trembling aspen encroachment, and thus accurately capture changes in its density and cover with the applied treatments. The location of these plots, however, are not adequate to assess encroachment by other species such as Bebb's willow and bog birch which had low abundance and patchy distribution in the study area, and generally invade in limited areas such as mesic sites along drainages (Bork et al., 1996; de Groot and Wein, 1999).

Table 4-1. Mean cover of trembling aspen in each plot in each survey year for the prescribed burn study in Prince Albert National Park, 1975-2010. Plot numbers ending in '1' indicate grassland plots, and plot numbers ending in '2' indicate forest transition plots. Season of burn treatments are represented by c- prior to burning, s - spring and f - fall. The number of burn treatments are listed as three, four or five. Cover of other woody species encountered in plots surveyed in 2010 are shown in Appendix J.

Year	Plot	Season	Burns	Cover
1975	1171	c	5	0.40
1975	1172	c	5	5.08
1975	1181	c	5	1.48
1975	1182	c	5	9.52
1975	1271	c	3	2.88
1975	1272	c	3	7.76
1975	1281	c	3	2.08
1975	1282	c	3	13.20
1975	2171	c	4	2.28
1975	2172	c	4	3.00
1975	2181	c	4	1.20
1975	2182	c	4	1.40
1975	2271	c	4	2.08
1975	2272	c	4	1.80
1975	2281	c	4	0.00

1975	2282	c	4	2.20
1975	2112	c	4	3.20
1975	2212	c	4	4.78
1975	3111	c	4	2.80
1975	3112	c	4	4.20
1975	3211	c	4	3.20
1975	3212	c	4	2.80
1983	1171	f	5	0.60
1983	1172	f	5	9.32
1983	1181	f	5	0.20
1983	1182	f	5	3.24
1983	1271	f	3	0.00
1983	1272	f	3	3.04
1983	1281	f	3	1.68
1983	1282	f	3	3.64
1983	2171	s	4	0.60
1983	2172	s	4	6.04
1983	2181	s	4	2.04
1983	2182	s	4	7.68
1983	2271	s	4	0.00
1983	2272	s	4	4.88
1983	2281	s	4	0.80
1983	2282	s	4	11.80
1983	2112	s	4	6.64
1983	2212	f	4	5.28
1983	3111	f	4	3.04
1983	3112	f	4	8.32
1983	3211	s	4	4.28
1983	3212	s	4	3.04
1995	1171	f	5	0.84
1995	1172	f	5	18.44
1995	1181	f	5	0.20
1995	1182	f	5	9.12
1995	1271	f	3	0.20
1995	1272	f	3	6.44
1995	1281	f	3	2.88
1995	1282	f	3	12.32
1995	2171	s	4	0.00
1995	2172	s	4	1.24
1995	2181	s	4	0.00
1995	2182	s	4	2.08
1995	2271	s	4	0.00
1995	2272	s	4	3.24

1995	2281	s	4	0.00
1995	2282	s	4	2.48
1995	2112	s	4	7.08
1995	2212	f	4	3.68
1995	3111	f	4	4.16
1995	3112	f	4	20.76
1995	3211	s	4	5.76
1995	3212	s	4	4.16
2010	1171	f	5	2.04
2010	1172	f	5	37.40
2010	1181	f	5	4.96
2010	1182	f	5	20.44
2010	1271	f	3	0.64
2010	1272	f	3	2.84
2010	1281	f	3	2.88
2010	1282	f	3	27.36
2010	2171	s	4	7.60
2010	2172	s	4	25.20
2010	2181	s	4	7.44
2010	2182	s	4	34.12
2010	2271	s	4	0.60
2010	2272	s	4	33.36
2010	2281	s	4	11.08
2010	2282	s	4	41.32
2010	2112	s	4	42.60
2010	2212	f	4	49.52

Table 4-2. Mean density of trembling aspen in each plot in each survey year for the prescribed burn study in Prince Albert National Park, 1975-2010. Plot numbers ending in ‘2’ indicate forest transition plots. Season of burn treatments are represented by c- prior to burning, s - spring and f - fall. The number of burn treatments are listed as three, four or five. Stem diameters of other woody species encountered in plots surveyed in 2010 are shown in Appendix J.

Year	Plot	Season	Burns	Density
1975	1172	f	5	13.60
1975	1182	f	5	9.00
1975	1272	f	3	3.40
1975	1282	f	3	13.40
1975	2172	s	4	6.20

1975	2182	s	4	5.00
1975	2272	s	4	2.50
1975	2282	s	4	7.10
1975	2112	s	4	6.10
1975	2212	f	4	11.20
1975	3112	f	4	9.30
1975	3212	s	4	4.60
1983	1172	f	5	16.70
1983	1182	f	5	9.80
1983	1272	f	3	4.80
1983	1282	f	3	5.50
1983	2172	s	4	27.80
1983	2182	s	4	16.90
1983	2272	s	4	8.20
1983	2282	s	4	36.60
1983	2112	s	4	7.50
1983	2212	f	4	8.40
1983	3112	f	4	10.90
1983	3212	s	4	4.70
1995	1172	f	5	8.44
1995	1182	f	5	8.00
1995	1272	f	3	3.44
1995	1282	f	3	3.20
1995	2172	s	4	8.52
1995	2182	s	4	6.12
1995	2272	s	4	4.52
1995	2282	s	4	10.60
1995	2112	s	4	5.04
1995	2212	f	4	7.88
1995	3112	f	4	4.84
1995	3212	s	4	3.32
2010	1172	f	5	5.96
2010	1182	f	5	3.80
2010	1272	f	3	1.00
2010	1282	f	3	1.52
2010	2172	s	4	3.68
2010	2182	s	4	4.00

4.3.3 Statistical analysis

The effects of the number of burns, season of burning, and time since burning on trembling aspen density were determined using generalized linear mixed models fitted with a Poisson distribution. This approach was taken as a poisson distribution is most appropriate for count data (Crawley, 2007). The effects of the burn treatments on trembling aspen cover were analyzed using general linear models as the cover class data were the mean of 25 quadrats per plot and thus presumed to follow a normal distribution. All analyses were conducted using the lmer and lme functions in the R.2.12.1 package (R Development Team, 2010).

Model selection procedures (Crawley, 2007) were used where a maximal model containing all possible terms was reduced by the combination of non-significantly different treatments and the removal of non-significant model terms. If combining treatments or removing a term resulted in a non-significant drop in variance explained ($P \geq 0.05$) then the simplified model was retained and further simplified if possible. The minimally adequate (best) model from the above procedure was compared against the maximal model to confirm there was not a significant drop in variance ($P \geq 0.05$) explained. The minimally adequate (best) model was then compared to a null model containing only the random terms. A significant difference between the null and minimally adequate (best) model ($P < 0.05$) confirmed fixed factors retained in the minimally adequate (best) model represented significant differences in trembling aspen density or cover. This approach is particularly powerful in a study with a complex experimental design and relatively small sample size, as the removal of non-significant treatment effects permits a more powerful test of the remaining model terms.

The maximal model for trembling aspen density and cover in the forest transition community included year, season and number of burns as main effects, and the year by season and year by number of burns interactions. No grassland plots were established in the Rabbit Creek site due to its small size, providing only a single replicate of the four fall burn treatment combination in the grassland community. With only one replicate of that treatment combination, fitting interaction terms would likely cause spurious results, thus only the year, season, and number of burns terms were included in the maximal model. As spring treatment plots were burned four times only, the incomplete factorial design precluded testing the season by number

of burns interaction in all models. Random factors for all analyses included plot and grassland area, with plots nested within grassland areas. Random factors were specified to address the non-independence of samples arising through repeated measures of plots, and the nesting of plots within different grassland areas.

4.4 Results

Trembling aspen density was significantly affected by year and the season by year interaction, but was not affected by the number of burns (Fig. 4-1). The best density model included year with 1975 and 1995 combined, season, and the year by season interaction (maximal vs. best model χ^2_8= 13.18, P=0.214). Density increased 91% from 1975 to 1983, and then declined 48% from 1983 to 1995. Density significantly declined through time, and was 76% lower in 2010 than in 1983 (z=-3.84, P<0.001). A year by season interaction occurred as spring burned plots had 32% lower density than fall burned plots in 1975-1995, but 28% higher density than fall burned plots in 1983 (z=-3.98, P<0.001).

Cover of trembling aspen in the forest transition community was significantly affected by number of burns, season, and the year by number of burns interaction (Fig. 4-1). The best model for trembling aspen cover in the forest transition community included year with 1975, 1983 and 1995 combined, season, number of burns, the year by number of burns interaction, and the year by season of burn interaction (maximal model vs. best model $F_{11, 19}$=12.75, P=0.121). Trembling aspen cover in the forest transition community was 19% greater with four burns (t= 5.21, P=0.002) and 39% greater with five burns (t=2.48, P=0.048) compared to three burns. Spring burns had 12% less trembling aspen cover compared to fall burns (t= -2.51, P=0.046). Cover increased through time with burns, as shown by the year by number of burns interaction; a) four burns had 648% less trembling aspen cover in 1975, 1983 and 1995 than in 2010 (t=-4.94, P<0.001), and b) five burns had 222% less trembling aspen cover in 1975, 1983 and 1995 than in 2010 (t=-2.08, P=0.046). The year by season interaction shows cover of plots burned in the fall increased 111% from 1975, 1983 and 1995 to 2010, while cover in spring burned plots increased 89% over the same time period (t=1.83, P=0.077). Although the year by season interaction was not statistically significant, it was retained in the model as its removal reduced the variance explained (previous minimally adequate model vs. model with year by season removed $F_{10,}$

$_{11}$=3.66, P=0.056), and the interaction provided a clear biological explanation supplementing the main effects alone.

Cover of trembling aspen in the grassland community was significantly affected by year, but not by season or number of burns (Fig. 4-1). The best model for trembling aspen cover in the grassland community included year with 1975, 1983 and 1995 combined (maximal model vs. best model $F_{5, 10}$=2.58, P=0.764). Trembling aspen cover in the grassland remained stable between 1975, 1983 and 1995, but increased 216% between 1995 and 2010 (t=-4.45, P<0.001).

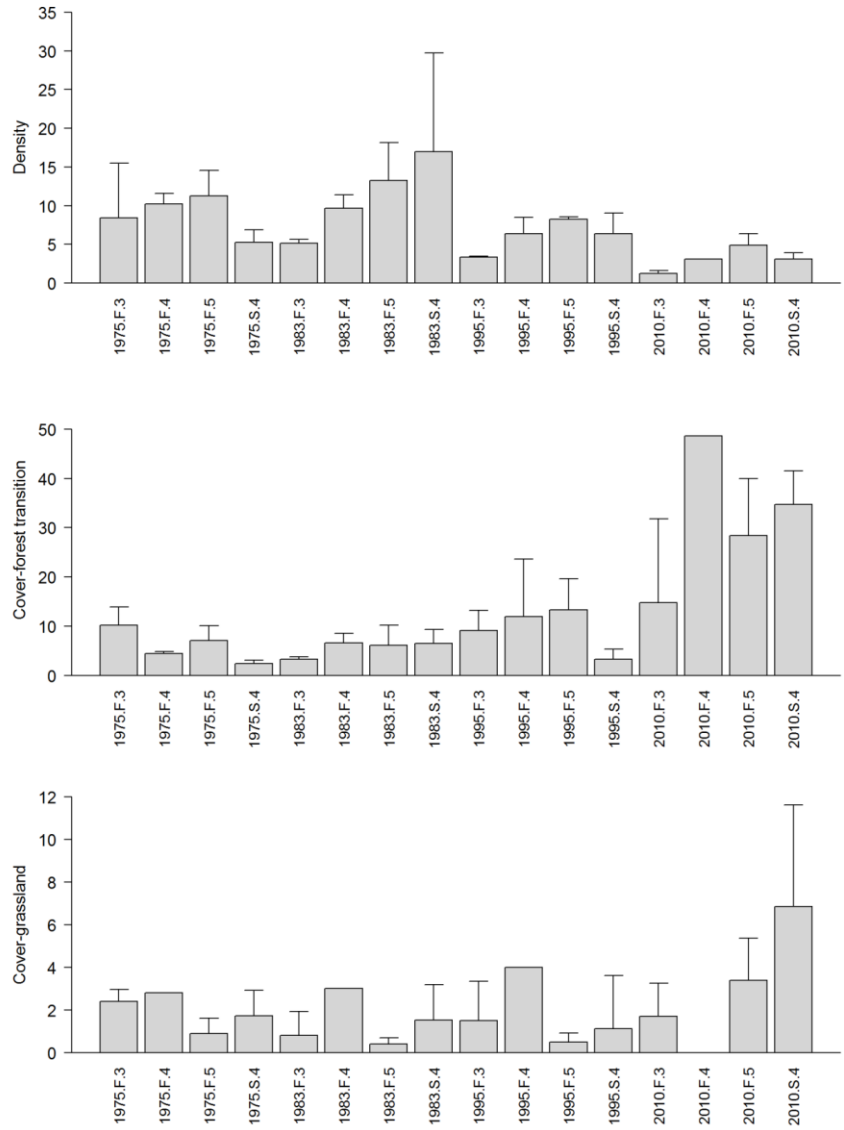

Figure 4-1. Mean trembling aspen density in the forest transition community, mean trembling aspen cover in the forest transition community and mean trembling aspen cover in the grassland community with the prescribed burn treatments applied during the prescribed burn study in Prince Albert National Park, 1975-2010. Treatments codes on the x-axis indicate year (1975, 1983, 1995 and 2010), season of burning (F=fall, S=spring) and number of burns (3, 4 and 5). Note change in y-axis scales between density in the forest transition, cover in the forest transition, and cover in the grassland. Error bars are one standard deviation. The four fall burns treatment had only one replicate in 2010 for density and cover in the forest transition, and thus do not have error bars. The four fall burns treatment had only one replicate in 1975, 1983 and 1995 for cover in the grassland, and thus do not have errors bars. There was no four fall burns treatment in the grassland in 2010. Due to the complexity of the interactions in the models, letters indicating significance of fixed effects are not shown.

4.5 Discussion

None of the prescribed burn treatments applied in this study reduced trembling aspen in the long-term. Suppressing trembling aspen encroachment is a critically important issue in maintaining Fescue Grassland in PANP; this study demonstrates that prescribed burning as applied in this study is likely to be ineffective, and may actually promote encroachment. This response is not entirely unexpected however, as prescribed burning as a means of controlling encroachment has had negligible results in other grasslands in the Northern Great Plains (Heisler et al., 2003; Heisler et al., 2004; Briggs et al., 2005). Infrequent fire in other areas of the Fescue Prairie also leads to increased encroachment by trembling aspen, bog birch and willow species (Bailey et al., 1990; Bork et al., 1997; Bork and Burkinshaw, 2009).

The inability of prescribed burning to control encroachment may be explained by the stimulatory affect fire can have on trembling aspen. Control of regrowth after burning necessitates relies on a secondary from of suppression. If suckering is left unchecked, trembling aspen can colonize and dominate disturbed sites (Maini, 1960; Schier, 1972; Mueggler, 1989; Keyser et al., 2005). Increased soil water content and temperature after fire are considered important factors in sucker initiation; facilitating growth earlier in the spring providing a longer growing season, and is thought to promote auxin degradation and cytokinin synthesis (Johnston, 1981; Hungerford, 1988; Fraser et al., 2002). The increased density observed in 1983 with spring burning agrees with these findings, as soil temperatures were likely warmer longer with spring burning in comparison to fall burning. Cover of trembling aspen may also increase with time after burning through the growth of suckers and recovery of mature trees in the overstory. With this increase in growth, however, low light intensities may negatively affect growth of trembling aspen suckers (Farmer, 1963). Inter- and intraspecific competition for light and other resources promotes self thinning, as evidenced here by a reduction in density, but an increase in cover of trembling aspen over time since burning. Self thinning of new stems may be accelerated with spring burning; density was higher in spring burned plots where competition for light and resources was likely more intense (Hendrickson, 1988). Increased competition in the spring burned plots with greater sucker density may also explain why less cover was observed overtime in spring burned plots compared with fall burned plots in the forest transition community.

Trembling aspen recovery is dependent on stored resources available after disturbance, and frequency of disturbance is important in determining frequency of suckering at the

community level (Bellingham and Sparrow, 2000). If trembling aspen was able to recover between burn events, plots burned four and five times may have stimulated suckering more frequently than plots burned three times. This increase in suckering may explain why cover was greater with four and five burns in the forest transition community. With no initial trembling aspen overstory in the grassland community, post-burn sucker growth was likely less limited by light, and may explain the increase in trembling aspen cover over time in this community (Huffman et al., 1999).

Burning alone is not effective in controlling trembling aspen encroachment. Trembling aspen encroachment occurred despite using a prescribed burn program set within the historic fire return interval. Local history records indicate these Fescue Grasslands were burned, grazed and/or hayed regularly by settlers prior to park establishment c.1927 (Cameron, 1975; Trottier, 1985). These practices continued after PANP was formed, and regular spring burns were conducted by park staff for wildlife habitat and aesthetic purposes until c.1960 (O'Brodovich, 1997). After 1960, the Fescue Grasslands were no longer under the influence of regular spring burning, but were likely still within the historic fire return interval. Losses of Fescue Grassland from 512 ha in 1947 to 310 ha in 1962 were observed, and the 1947 area serves as the basis for the current grassland restoration target (Parks Canada, 2011). This reduction in grassland area may indicate a shift in the grassland-forest boundary towards its position before annual burning, grazing and/or haying. The time lapse between 1960 and the beginning of the prescribed burn experiment in 1975 was also well within the historic fire return interval. Encroachment continued through time regardless of burning. Trembling aspen encroachment in these grasslands may be viewed as an ongoing recovery from years of regular burning and artificial expansion, rather than a relatively sudden period of encroachment by trembling aspen and loss of Fescue Grassland. It must be noted that the historic annual disturbances described above did not occur in other grasslands in PANP where encroachment has been considerable (Cameron, 1975; O'Brodovich, 1997; Parks Canada, 2011). Therefore it is unlikely that forest transitions rebounding from annual disturbance is the only cause of encroachment. However caution must be taken in setting a target area for Fescue Grassland restoration based on historical accounts, as the area of Fescue Grassland in the 1940s may have been inflated beyond its natural extent.

Alterations to the fire regime may have influenced successional processes such that burning now encourages encroachment rather than suppresses it. The roles of other major changes to the natural disturbance regime however cannot be discounted. In particular, the loss of fire and grazing interactions likely play roles in encroachment and loss of grassland area (Knaap and Seastedt, 1986; Campbell et al., 1994). Fire served to draw plains bison and other important grazing species such as elk into burned areas through forage with increased palatability (Fuhlendorf et al. 2009). Utilization of forage including trembling aspen suckers was high due to grazing, trampling, wallowing and general loitering in and near newly burned areas. The interactions of fire, elk and trembling aspen are well known from a standpoint of trembling aspen conservation in the Yellowstone and other Rocky Mountain National Parks (Romme et al., 1995; White et al., 1998). In these areas, trembling aspen is heavily used by elk, and prescribed burns are being suggested as a means of promoting growth of trembling aspen in areas with comparatively low elk populations.

Controlling trembling aspen encroachment is much more complex than effects of fire and trembling aspen alone, and likely involves successional pathways including interactions of climate, fire, grazing, and possibly behavioural interactions between grazers and predators. In the Fescue Grasslands of PANP, integrated management practices such as grazing after burning is needed to address suckering and prevent recovery of trembling aspen after fire (Bailey et al., 1990; Bork et al., 1996; Heisler et al., 2004; Briggs et al., 2005; Bork and Burkinshaw, 2009). Many opportunities exist in PANP to encourage mimic natural disturbance regimes involving fire and grazing. However, current management initiatives using prescribed burning alone to control trembling aspen encroachment may cause effects counter to what was intended. On the other hand, it is possible that targets for Fescue Grassland area go against successional processes to attain it. Despite which view is taken, maintaining Fescue Grassland is vital, and management actions to reintroduce natural disturbances, such as fire and grazing, are needed to sustain them.

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5.0 General discussion and conclusions

The studies included in this thesis provide a picture of how the Fescue Grasslands in Prince Albert National Park (PANP) have changed through time. The changes in grassland community abundance-occupancy relationship (AOR) in Chapter 3 reflect the disturbance-recovery mechanisms expected after prescribed burning. The grassland plant community AOR was variable over time since burning, while the forest transition plant community AOR remained steady over time. Should the grassland AOR become less variable, such as that seen in the forest transition, it may indicate a significant shift towards a community with increased dominance by woody species. The beginning of this transition was illustrated in Chapter 4, where trembling aspen density and cover increased over time after prescribed burning. The persistent dominance of trembling aspen in the forest transition community, and the increased cover of trembling aspen in the grassland community shows trembling aspen encroachment has occurred despite prescribed burning intended to suppress it.

5.1 Potential mechanisms driving AOR

Change in plant community structure is expected through time in the grassland and forest transition communities as they are regularly influenced by fire. However the mechanisms that drive changes in AOR with succession are not clear. Here I speculate on possible mechanisms that may drive the changes observed in AOR. Further experimental studies are needed to confirm these mechanisms and if they drive AORs. Direct and indirect effects of burning such as removal of litter and subsequent changes in soil resources may explain the patterns observed in AOR. Burning likely altered the grassland AORs through an interaction between burning, litter and soil resources. Aboveground phytomass and the availability of soil moisture and nutrients in grasslands are influenced by burning (Anderson and Bailey, 1980). Burning directly consumes litter and hence indirectly modifies the microenvironment causing changes to soil moisture retention, temperature, and releases nutrients tied up in biomass (Anderson and Bailey, 1980; Facelli and Pickett, 1991). Accumulation of litter increases soil moisture retention as it reduces runoff and erosion, dissipates rain energy, increases infiltration and reduces evaporation (Xiong

and Nilsson, 1999). Litter also reduces light availability at the soil surface, buffers soil temperatures, houses pathogens and physically impedes plant growth. In the Fescue Prairie, accumulations of litter can negatively affect species richness and evenness by suppressing low statured species, as well as delay early growing season development (Lamb, 2008; Deutsch et al., 2010).

When litter is removed by burning, a cascade of indirect effects can occur. Soil is more exposed leaving it prone to erosion, desiccation and temperature fluctuation that may induce temperature and moisture stress in plants. Loss of litter also increases light intensity and soil temperatures leading to increased growth rates for some species, which can ultimately influence species richness and evenness (Xiong and Nilsson, 1999; Lamb, 2008). Consequently, the removal of litter and changes to resources and microclimate can allow space for the establishment of more individuals of some species, or may permit an increase in the growth and cover of plants which were already established.

Litter mass was likely high prior to the beginning of burning in 1975 as the most recent known fire occurred 28 years previously (Parks Canada, 2011). Between 1975 and 1983 plots were burned three to five times and at different seasons (Trottier, 1985). Litter was likely substantially reduced compared to the 1975 pre-burn survey, as litter amounts can take up to 11 years to recover in the Fescue Prairie (Pylypec and Romo, 2003). The reduction in litter likely increased light penetration and temperatures at the soil surface, bringing favourable growing conditions for low statured species unable to persist under amounts of litter (Xiong and Nilsson, 1999; Lamb, 2008), creating a window for abundance to increase relative to occupancy. As discussed in Chapter 3, short-statured grasses and graminoids such as *Carex* spp., *Koeleria macrantha* (Ledeb.) J.A. Schultes and *Agrostis scabra* Willd., and low growing forbs *Viola adunca* Sm., *Cerastium arvense* L., *Orthocarpus luteus* Nutt., and *Polygala senega* L. showed large increases in abundance relative to occupancy between the 1975 pre-burn and 1983 post-burn surveys (Table 3-4, Appendix H). Similar changes in plant community structure have been reported by Gross and Romo (2010), where forb species richness was highest at two and three years after burning, and repeated burn events favoured species with rhizomatous growth such as *Carex spp*. Litter amounts at the 1995 survey were likely high, having a longer period of time since burning to recover. Soil temperature and light penetration would have likely fallen

concurrently with the increase in litter. Plants no longer had the influx of resources brought by burning and loss of litter, causing grassland local density and AOR to move closer to the 1975 position. These changes were illustrated by the decrease in abundance relative to occupancy between 1983 and 1995 of low-statured species such as *Koeleria macrantha* (Ledeb.) J.A. Schultes, *Orthocarpus luteus* Nutt., *Cerastium arvense* L., and *Carex* spp. that had initially increased after burning. With a long period of time since burning, litter accumulations were high as average light interception by litter at the site in April 2010 was 71% ±12% (mean ± SD, n=58) (E. G. Lamb, unpublished data). At that level of litter accumulation, low-statured plants would receive only 350-520 µmol m^{-2} s^{-1} in full sunlight (1200-1800 µmol m^{-2} s^{-1}), below the photosynthetic saturation point of most plant species (Fitter and Hay, 2002). With this amount of litter, a similar AOR between the 1995 and 2010 surveys would be expected. However an increase in abundance relative to occupancy was observed in 2010, and was driven by tall species such as *Hierochloe odorata* (L.) Beauv. and *Potentilla arguta* Pursh, species with erect growth forms such as *Sisyrinchium montanum* Greene, and plastic species such as *Fragaria virginiana* Duchesne. The change in AOR despite the likely high litter levels in the 1995 and 2010 surveys suggests other mechanisms in addition to litter may have acted to shape AORs in the grassland plant community.

Precipitation is often limiting to phytomass production in the Fescue Prairie (Smoliak, 1986; Lamb, 2008) and annual weather fluctuations can influence plant community composition (Biondini et al., 1998; Gross and Romo, 2010). Increased soil moisture may explain the increased abundance of some species in 2010, as growing season (May-September) precipitation was 135% (407 mm) of the 42-year average (301 mm) (Appendix H). Species with the ability to tolerate greater amounts of litter may have been able to achieve larger than normal sizes due to the greater soil moisture. Precipitation during the 1995 survey may have also had a compounding influence on AORs, as growing season precipitation was only 71% (215 mm) of the 42-year average (Environment Canada, 2011) (Appendix H). This reduced growth brought by low precipitation may have accentuated the drop in abundance in 1995 compared to the 1983 survey, where growing season precipitation was 99% (298 mm) of the average. It seems plausible that succession and precipitation caused changes to the AOR in the grassland plant community; however separating these mechanisms is not possible in a study with only one period of prescribed burning and four precipitation records.

In contrast to the grassland community, the AOR in the forest transition community did not change with time since disturbance. While burning likely had similar effects on litter and soil resources in the forest transition community as in the grassland, such effects likely had a much shorter-lived influence relative to the rapid response of trembling aspen to burning. Trembling aspen regenerates vigorously from suckering following fire, allowing it to rapidly regain dominance (Maini, 1960; Mueggler, 1989; Keyser et al., 2005). Recovery of the forest canopy and suckering would maintain a similar understory microclimate over time. The trembling aspen canopy intercepts light, reduces evaporation losses, and moderates air and soil temperatures (Archibold et al., 1996; Groot et al. 1997; Ripley and Archibold, 1999). As soil resources are stabilized and regulated by the understory microclimate, plant community structure in the forest transition and AOR may be less variable through time. Burning may have thus created a shorter-lived window for change in species abundance and occupancy in the forest transition plant community than in the grassland. The sampling interval used in this study was likely too long to detect succession caused changes in the forest transition community AOR.

Precipitation likely had a limited impact on forest transition community AORs relative to the grassland community. Trembling aspen stands retain more snow cover relative to adjacent grassland areas, and are able to access less variable soil moisture resources through deep rooting (Archibold et al., 1996; Groot et al. 1997; Ripley and Archibold, 1999). Retention of soil water under the tree canopy is further enhanced by lower air and soil temperatures and lower evaporative demand. These buffers to growing season moisture suggest fluctuations in precipitation may be less important in the forest transition community than in the grassland.

5.2 Management implications

The responses observed in this study indicate that prescribed burning may be of limited use for controlling trembling aspen encroachment in the Fescue Grasslands of PANP. However prescribed burning for the management of these grasslands should be retained for several reasons. Firstly, the 35-year prescribed burn experiment used in this study is only a short period in the history of the Fescue Prairie. To definitively say repeated prescribed burning caused encroachment disregards effects of climate, grazing, and other potential factors and management practices that were not possible to include in this study. More information is needed to

disentangle the causes of encroachment and better assess risks to these Fescue Grasslands. Secondly, fire and grazing disturbances played a large historical role in the functioning, composition and structure of the Fescue Prairie (Anderson and Bailey, 1980; Campbell et al., 1994; Romo, 2003). Grazers such as plains bison and elk followed fire, consuming and trampling young, palatable vegetation including woody species such as trembling aspen. Over time, grazing pressure in these areas was reduced and litter accumulated, increasing the probability of fire. These historical patterns between fire and grazing are inhibited by the fragmented state of the Fescue Prairie, lacking sources of fire ignition, and loss of keystone species such as plains bison. Although the fire regime in the Fescue Grasslands of PANP (and likely much of the Fescue Prairie) is no longer regulated by these natural processes but by management actions, grazing could still play a vital role in limiting trembling aspen encroachment by controlling density and cover after burning. Interacting effects of burning and grazing may improve the management of these fescue grasslands, where these disturbances work together to control trembling aspen encroachment (Bailey et al., 1990). Including such changes in management may better reflect natural disturbances, where risk of continued alteration of Fescue Grassland is more appropriately addressed. To re-introduce fire and grazing disturbances on a historical scale in the Fescue Prairie is not achievable; however, to not encourage interactions between them at all knowingly neglects important processes that, until recently, maintained these Fescue Grasslands.

A unique opportunity to emulate natural disturbance processes occurs in PANP, where a free-ranging plains bison herd exists and prescribed burns are undertaken. Regaining connectivity between these key components would greatly improve the management of these Fescue Grasslands. To reconnect fire and grazing would be an accomplishment towards improved management of remnant Fescue Prairie. Continued monitoring of trembling aspen cover and density, and AORs in grassland and adjacent forest transition communities used in this study will help determine if management practices are effective in addressing risks to the Fescue Grasslands in PANP over time.

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6. Appendix A. Species lists

Table 6-1. Species encountered in study plots over the prescribed burn study in Prince Albert National Park, 1975-2010. A six letter species epithet was used to refer to species over all survey periods. The first three letters or the epithet correspond to the genus, and the last three letters correspond to the species name. Species nomenclature corresponds to November 2010 standing in Integrated Taxonomic Information System (ITIS) (www.itis.gov).

Scientific name	Epithet	Common name
Achnatherum richardsonii (Link) Barkworth	Ach.ric	Richardson's needlegrass
Agrostis scabra Willd.	Agr.sca	Hair grass
Bromus ciliatus L.	Bro.cil	Fringed brome
Bromus inermis Leyss.	Bro.ine	Smooth brome
Bromus inermis ssp. *pumpellianus* (Scribn.) Wagnon	Bro.pum	Pumpelly's brome
Calamagrostis canadensis (Michx.) Beauv.	Cal.can	Bluejoint
Calamagrostis montanensis Scribn. ex Vasey	Cal.mon	Plains reedgrass
Calamagrostis rubescens Buckl.	Cal.rub	Pinegrass
Calamagrostis stricta ssp. *inexpansa* (Gray) C.W. Greene	Cal.ine	Northern reedgrass
Carex species	Car.spp	Carex species
Danthonia intermedia Vasey	Dan.int	Timber oatgrass
Elymus lanceolatus ssp. *lanceolatus* (Scribn. & J.G. Sm.) Gould	Ely.lan	Northern wheatgrass
Elymus trachycaulus ssp. *subsecundus* (Link) A.& D. Löve	Ely.sub	Awned wheatgrass
Elymus trachycaulus ssp. *trachycaulus* (Link) Gould ex Shinners	Ely.tra	Slender wheatgrass
Elymus villosus Muhl. ex Willd.	Ely.vil	Hairy wild rye
Festuca brachyphylla J.A. Schultes ex J.A. & J.H. Schultes	Fes.bra	Alpine fescue
Festuca hallii (Vasey) Piper	Fes.hal	Plains rough fescue
Festuca saximontana var. *saximontana* Rydb.	Fes.sax	Rocky mountain fescue
Helictotrichon hookerii (Scribn.) Henr.	Hel.hoo	Hooker's oat grass
Hesperostipa comata (Trin. & Rupr.) Barkworth	Hes.com	Needle and thread
Hesperostipa curtiseta (A.S. Hitchc.) Barkworth	Hes.cur	Western porcupine grass
Hesperostipa spartea (Trin.) Barkworth	Hes.spa	Porcupine grass
Hierochloe odorata (L.) Beauv.	Hie.odo	Sweetgrass
Koeleria macrantha (Ledeb.) J.A. Schultes	Koe.mac	June grass
Muhlenbergia cuspidata (Torr. ex Hook.) Rydb.	Muh.cus	Plains muhly
Muhlenbergia racemosa (Michx.) B.S.P.	Muh.rac	Marsh muhly
Muhlenbergia richardsonis (Trin.) Rydb.	Muh.ric	Mat muhly
Oryzopsis asperifolia Michx.	Ory.asp	Roughleaf ricegrass
Pascopyrum smithii (Rydb.) A. Löve	Pas.smi	Western wheatgrass
Piptatherum canadense (Poir) Barkworth, comb. nov. ined.	Pip.can	Canadian ricegrass

Poa palustris L.	Poa.pal	Fowl bluegrass
Poa pratensis L.	Poa.pra	Kentucky bluegrass
Poaceae	Poac.unk	Unknown Poaceae
Schizachne purpurascens (Torr.) Swallen	Sch.pur	False melic
Sporobolus R. Br.	Spo.spp	Dropseed
Achillea millefolium L.	Ach.mil	Common yarrow
Agastache foeniculum (Pursh) Kuntze	Aga.foe	Giant hyssop
Agoseris glauca (Pursh) Raf.	Ago.gla	Pale agoseris
Agrimonia striata Michx.	Agr.str	Woodland grooveburr
Allium cernuum Roth	All.cer	Nodding onion
Allium stellatum Nutt. ex Ker-Gawl.	All.ste	Prairie onion
Amerorchis rotundifolia (Banks ex Pursh) Hultén	Ame.rot	Roundleaf orchid
Androsace septentrionalis L.	And.sep	Pygmy flower
Anemone canadensis L.	Ane.can	Canada anemone
Anemone cylindrica Gray	Ane.cyl	Candle anemone
Anemone multifida Poir.	Ane.mul	Cutleaf anemone
Antennaria neglecta Greene	Ant.neg	Field pussytoes
Antennaria microphylla Rydb.	Ant.mic	Small-leaf pussytoes
Antennaria species	Ant.spp	Antennaria species
Apocynum androsaemifolium L.	Apo.and	Spreading dogbane
Arabis hirsuta (L.) Scop.	Ara.hir	Hairy rockcress
Aralia nudicaulis L.	Ara.nud	Wild sarsaparilla
Arnica fulgens Pursh	Arn.ful	Foothill arnica
Artemisia campestris L.	Art.cam	Common sagewort
Artemisia frigida Willd.	Art.fri	Fringed sagebrush
Artemisia ludoviciana Nutt.	Art.lud	Prairie sage
Aster species	Ast.spp	Aster species
Astragalus laxmannii var. *robustior* (Hook.) Barneby & Welsh	Ast.lax	Prairie milkvetch
Botrychium virginianum (L.) Sw.	Bot.vir	Rattlesnake fern
Campanula rotundifolia L.	Cam.rot	Harebell
Castilleja miniata ssp. *miniata* Dougl. ex Hook.	Cas.min	Scarlet paintbrush
Cerastium arvense L.	Cer.arv	Field chickweed
Chenopodium album L.	Che.alb	Lambsquarters
Cirsium arvense (L.) Scop.	Cir.arv	Canada thistle
Cirsium foliosum (Hook.) DC.	Cir.fol	Drummond's thistle
Coeloglossum viride var. *viride* (L.) Hartman	Coe.vir	Longbract frog orchid
Comandra umbellata ssp. *pallida* (A. DC.) Piehl	Com.pal	Bastard toadflax
Cornus canadensis L.	Cor.can	Canadian bunchberry
Crepis tectorum L.	Cre.tec	Narrowleaf hawksbeard
Disporum trachycarpum (S. Wats.) Benth. & Hook. f.	Dis.tra	Roughfruit fairybells
Epilobium angustifolium ssp. *angustifolium* L.	Epi.ang	Fireweed
Erigeron acris var. *kamtschaticus* (DC.) Herder	Eri.acr	Blue fleabane
Erigeron glabellus Nutt.	Eri.gla	Smooth fleabane

Erigeron glabellus var. *glabellus* Nutt.	Eri.gvg	Rough fleabane
Fragaria virginiana Duchesne	Fra.vir	Wild strawberry
Gaillardia aristata Pursh	Gai.ari	Gaillardia
Galium boreale L.	Gal.bor	Northern bedstraw
Galium trifidum L.	Gal.trf	Small bedstraw
Galium triflorum Michx.	Gal.tri	Sweet bedstraw
Gentiana affinis Griseb.	Gen.aff	Pleated gentian
Gentianella amarella ssp. *acuta* (Michx.) J. Gillett	Gen.ama	Autumn dwarf gentian
Geum aleppicum Jacq.	Geu.ale	Yellow avens
Geum triflorum Pursh	Geu.tri	Old man's whiskers
Hedysarum alpinum L.	Hed.alp	Alpine sweetvetch
Heterotheca villosa var. *villosa* (Pursh) Shinners	Het.vil	Hairy false golden-aster
Heuchera richardsonii R. Br.	Heu.ric	Alumroot
Hieracium umbellatum L.	Hie.umb	Narrowleaf hawkweed
Hieracium gracile Hook.	Hie.gra	Slender hawkweed
Lathyrus ochroleucus Hook.	Lat.och	Cream peavine
Lathyrus venosus Muhl. ex Willd.	Lat.ven	Veiny peavine
Liatris ligulistylis (A. Nelson) K. Schum.	Lia.lig	Meadow blazing star
Lilium philadelphicum L.	Lil.phi	Wood lily
Lithospermum canescens (Michx.) Lehm.	Lit.can	Hoary puccoon
Lycopodium species	Lyc.spp	Lycopodium species
Lysimachia ciliata L.	Lys.cil	Fringed yellow-loosestrife
Maianthemum canadense Desf.	Mai.can	False lily-of-the-valley
Maianthemum stellatum (L.) Link	Mai.ste	False solomon's seal
Mertensia paniculata (Ait.) G. Don	Mer.pan	Tall bluebells
Mitella nuda L.	Mit.nud	Bare-stem bishop's cap
Monarda fistulosa L.	Mon.fis	Wild bergamot
Mulgedium oblongifolium (Nutt.) Reveal	Mul.obl	Blue lettuce
Orthilia secunda (L.) House	Ort.sec	One-sided wintergreen
Orthocarpus luteus Nutt.	Ort.lut	Yellow owl's-clover
Oxytropis campestris (L.) DC.	Oxy.cam	Field locoweed
Petasites frigidus (L.) Fr.	Pet.fri	Sweet coltsfoot
Polygala senega L.	Pol.sen	Seneca snakeroot
Potentilla arguta Pursh	Pot.arg	Tall cinquefoil
Potentilla pensylvanica L.	Pot.pen	Prairie cinquefoil
Prenanthes racemosa Michx.	Pre.rac	White lettuce
Pulsatilla patens ssp. *multifida* (Pritz.) Zamels	Pul.mul	Prairie crocus
Pyrola asarifolia Michx.	Pyr.asa	Pink wintergreen
Selaginella densa Rydb.	Sel.den	Small clubmoss
Silene drummondii var. *drummondii* Hook.	Sil.dru	Drummond's campion
Sisyrinchium montanum Greene	Sis.mon	Mountain blueeyed grass
Solidago canadensis L.	Sol.can	Canada goldenrod
Solidago missouriensis Nutt.	Sol.mis	Prairie goldenrod

Solidago nemoralis Aiton	Sol.nem	Gray goldenrod
Solidago rigida L.	Sol.rig	Stiff-leaved goldenrod
Solidago spathulata DC.	Sol.spa	Coast goldenrod
Solidago L.	Sol.spp	Goldenrod
Sonchus arvensis L.	Son.arv	Perennial sowthistle
Sonchus species	Son.spp	Sonchus species
Spiranthes romanzoffiana Cham.	Spi.rom	Hooded lady's tresses
Stellaria longifolia Muhl. ex Willd.	Ste.lon	Longleaf chickweed
Symphyotrichum ciliolatum (Lindl.) A. Löve & D. Löve	Sym.cil	Lindley's aster
Symphyotrichum laeve (L.) A. Löve & D. Löve	Sym.lae	Smooth blue aster
Taraxacum officinale F.H. Wigg.	Tar.off	Dandelion
Thalictrum venulosum Trel.	Tha.ven	Veiny meadowrue
Trifolium pratense L.	Tri.pra	Red clover
Trifolium repens L.	Tri.rep	White clover
Vicia americana Muhl. ex Willd.	Vic.ame	American vetch
Viola adunca Sm.	Vio.adu	Blue violet
Viola canadensis L.	Vio.can	Canada violet
Zizia aptera (Gray) Fern.	Ziz.apt	Heart-leaf alexanders
Zygadenus elegans Pursh	Zyg.ele	Mountain death-camas
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Ame.aln	Saskatoon
Arctostaphylos uva-ursi (L.) Spreng.	Arc.uva	Bearberry
Betula pumila var. *glandulifera* Regel	Bet.pum	Bog birch
Betula X sargentii Dugle	Bet.sar	Sargent's birch
Corylus cornuta Marsh.	Cor.cor	Beaked hazelnut
Lonicera dioica L.	Lon.dio	Limber honeysuckle
Picea glauca (Moench) Voss	Pic.gla	White spruce
Pinus banksiana Lamb.	Pin.ban	Jack pine
Populus balsamifera L.	Pop.bal	Balsam poplar
Populus tremuloides Michx.	Pop.tre	Trembling aspen
Prunus pensylvanica L. f.	Pru.pen	Pin cherry
Prunus virginiana L.	Pru.vir	Chokecherry
Ribes oxyacanthoides L.	Rib.oxy	Canadian gooseberry
Rosa acicularis Lindl.	Ros.aci	Prickly rose
Rubus idaeus L.	Rub.ida	Common red raspberry
Rubus pedatus Sm.	Rub.ped	Strawberryleaf raspberry
Rubus pubescens Raf.	Rub.pub	Dwarf red raspberry
Salix bebbiana Sarg.	Sal.beb	Bebb's willow
Shepherdia canadensis (L.) Nutt.	She.can	Russet buffaloberry
Symphoricarpos albus (L.) Blake	Sym.alb	Common snowberry
Symphoricarpos occidentalis Hook.	Sym.occ	Western snowberry
Vaccinium caespitosum Michx.	Vac.cae	Dwarf dilberry
Vaccinium myrtilloides Michx.	Vac.myr	Velvetleaf huckleberry

Table 6-2. Species grouping table for species encountered during the prescribed burn study in Prince Albert National Park, 1975-2010. To address potential identification issues stemming from different species lists and observers between years, it was necessary to group a small portion of species to the genus level. This was necessary when a genus level identification was used in any year, and if species were not consistently identified separately from other members of the same genus. When species grouped resulted in mid point average observations being combined, the midpoint averages were added and the resulting cover class midpoint average was used. The species grouped together, the new epithet and reasons for grouping are provided.

Grouped species	Epithet	Reason for grouping
Bromus ciliatus L. *Bromus inermis* ssp. *pumpellianus* (Scribn.) Wagnon	Bro.spp	Grouped in 1975, 1983, 1995
Calamagrostis montanensis Scribn. ex Vasey *Calamagrostis stricta* ssp. *inexpansa* (Gray) C.W. Greene	Cal.spp	*C.montanensis* listed in 1975 and 1983, *C. stricta* in 1995. Separate species can't be confirmed
Elymus trachycaulus ssp. *subsecundus* (Link) A.& D. Löve *Elymus trachycaulus* ssp. *trachycaulus* (Link) Gould ex Shinners	Ely.spp	Grouped as *Agropyron* species in 1975, 1983, 1995
*Hesperostipa comata (*Trin. & Rupr.) Barkworth *Hesperostipa curtiseta (*A.S. Hitchc.) Barkworth *Hesperostipa spartea (*Trin.) Barkworth	Hes.spp	*H. comata* and *H. spartea* grouped in 1975, 1983 and 1995. Only *H. curtiseta* listed in 2010
*Muhlenbergia cuspidata (*Torr. ex Hook.) Rydb. *Muhlenbergia richardsonis* (Trin.) Rydb.	Muh.spp	*M. richardsonis* listed in 1983, *M. cuspidata* in 1995. Separate species can't be confirmed
Oryzopsis asperfolia Michx. *Piptatherum canadense* (Poir) Barkworth, comb. nov. Ined	Ory.spp	*O. asperfolia* listed in 1975, 1983 and 2010; *P.canadens*e 1995. Can't confirm separate species
Poa palustris L. *Poa pratensis* L.	Poa.spp	Grouped as *Poa* species in 1975, 1983 and 1995
Allium cernuum Roth *Allium stellatum Nutt*. ex Ker-Gawl.	All.spp	*A.cernuum* and *A. stellatum* grouped in 1975 and 1983
Antennaria neglecta Greene *Antennaria microphylla* Rydb. *Antennaria species*	Ant.spp	*Antennaria* species listed in combination with *A. neglecta* and *A. microphylla*. Only *Antennaria* species listed in 1975
Erigeron acris var. *kamtschaticus* (DC.) Herder *Erigeron glabellus Nutt*. *Erigeron glabellus* var. *glabellus Nutt*.	Eri.spp	*Erigeron* species grouped in 1975 and 1983
Hieracium umbellatum L. *Hieracium gracile* Hook.	Hie.spp	Grouped together in 1975, 1983 and 1995
Solidago L. *Solidago spathulata* DC.	Sol.spa	*Solidago* listed 1975 and 1983. All other *Solidago* separated in 1975 and 1983 except *S. spathulata*
Sonchus arvensis L. *Sonchus canadensis*	Son.spp	*Sonchus canadensis* nomenclature not found. Grouped as *Sonchus* species
Symphyotrichum ciliolatus (Lindl.) A. Löve & D. Löve *Aster species*	Sym.cil	*Aster* species listed in 1975 and 1983, *S. ciliolatus* the only other aster found in 1995 and 2010
Betula pumila var. *glandulifera* Regel *Betula X sargentii* Dugle	Bet.spp	*B. sargentii* listed in 1975, *B. pumila* var. *glandulifera* in all other years
Rubus idaeus L. *Rubus pedatus* Sm.	Rub.spp	*R. pedatus* listed in 1975 and 1983, *R. idaeus* listed in 2010
Symphoricarpos albus (L.) Blake *Symphoricarpos occidentalis* Hook.	Sym.occ	*S. albus* listed in 1983, *S. occidentalis* in all other years

7. Appendix B. Raw species cover data

Table 7-1. Cover data for species encountered during the prescribed burn study in Prince Albert National Park, 1975-2010. 1975, 1983, 1995 cover data is reported as mid-point averages (5= 0.1-10, 15= 11-20, 25 = 21-30... 95 = 91-100) of cover classes (1= 1-10, 2= 11-20, 3=21-30...9= 91-100). 2010 data is reported as percent cover of each species. Only species present in each plot during the respective survey period are reported. Top row indicates the survey year and plot followed by quadrats within the plot ranging 1-25. Plot numbers ending in '2' indicate forest transition plots, while plots ending in '1' indicate grassland plots. Species epithets correspond to species names provided in Tables 6-1 and 6-2.

1975.0311	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric			75	55																					
Agr.sca					5	5		15	25			15		5	5										
Ely.spp	15	85		45	25		5			15	5		5	15	5		5	5	15		25	15	5	25	15
Fes.hal							55	75	65	55		65	25	45	25	25	55	65	55	35	15	25	65	5	5
Hes.spp											5					5				15		15	15		5
Hie.odo				5																					
Koe.mac	15		15				5	5	5			5	15			25	15	5		5	25		5	25	
Ach.mil	5	5			5		5	5	5	5	5	15	5	5	5	5	5	5	5	5		15	5	5	5
Aga.foe	5													15											
Ago.gla									5			5	5		5							5			
All.spp			5	5																					
Ane.cyl				5		5				5											5				
Art.fri	5		15		5	5																			
Art.lud					5	5														5				5	
Ast.lax			5																						
Cam.rot	5			5	5		5		5				5				5		5	5	5				5
Com.pal							5	5	5	5							5					5			
Eri.spp						15	15	5	5	5							15	5	5						
Fra.vir										5	5	5													
Gal.bor	5			5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	25	5	15	5	5
Geu.tri																		15	15	5		5	5	15	
Hed.alp						5					15														
Heu.ric																			5						
Lat.och	5	15							5	5	5		15	15	25	25				15					
Mai.ste															5										
Mon.fis	5																								5
Muh.obl										5															
Pol.sen			5	5																	5				
Sis.mon					5	5		5		5		5	5	5		5			5	5	5				
Sol.mis								5				5	5	15	5		5	5	5			5			
Sol.rig					5											5					5				
Son.spp							5						5		15										
Sym.lae				5			5		5		5			5	5	5	5	5							
Tha.ven	25								5	5	15		5	5						15					
Vic.ame	5	15	5	5		5	15	15	15		5	25		5	15			15	25	5	5	5		5	35
Vio.adu	5					5	5						5										5		
Ame.aln																								5	
Arc.uva											95														
Pop.tre	5	15		15	15		5	5			5		5	5	5	5					5				
Ros.aci	5	15			5	5	5	5	15	5					5		5			5	5	5	45	15	35
Sym.occ	15	15	5						5													5	5	5	5
rock																								5	

1975.0312	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca																				35					15
Car.spp	5		5					5		5					5		5		5	5	5	5	15	15	5

Ely.spp	55	65	55	45	65	25	65	15		55	35				25				15						25
Hes.spp								15																	
Koe.mac		15		5		15			5	5	15	5	5		25									15	
Ach.mil	5	5	5					5		5		5							5	5					5
Aga.foe														5	5	5			15				5	25	5
Ago.gla															5										
Ane.can																				5				5	5
Art.lud										5	5									5					5
Cam.rot						5				5										5					
Com.pal															5										
Fra.vir													5	15	5	5	5				5	5		5	
Gal.bor	5	5	5	5	5	5		5		15	5		5		5	5			5					5	
Geu.tri																				5				5	5
Hed.alp																					5				
Heu.ric								5						5											
Lat.och		5		25	5			35			5														
Mai.ste		5				5														5					5
Mon.fis				5		15		15	5																
Sis.mon															5					5					
Sol.rig	5						5	5		5			5												
Son.spp															5										
Sym.lae			15							5				5										5	5
Tar.off												5													
Tha.ven													5		5			5	5						
Vic.ame	5	15	5		15	5	5			5	25	5								5				5	
Vio.adu															5					5					5
Zyg.ele															5										
Bet.spp																	5	5							
Lon.dio																			5						
Pop.tre	5	5	5	5	5	5	5			5	5	5	5	5	5	5		5	5	5	5	5	5		
Pru.vir	25	5						5	5	5															
Ros.aci	15	5		5	5				55	15	15		15	25		15		15	15	15		5	25		15
Sym.occ		15		35	35	5						25													5
litter																					85	75	15	15	
bareground		15							75			35	55	45		65	75	85	15	15					

1975.1171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric															25										
Agr.sca							15							15	25								5		5
Car.spp								5	5	5			5	5				5	5	5		5	5	5	5
Ely.spp	15	15		5		5		5	25		5	15	5	15	15		15	5	25	5		5	5		
Ely.vil																								5	
Fes.hal	65	25	25	15			15	5	15	15	15	15			5	15	15		15		25	5	5	5	5
Hes.spp										15															
Koe.mac	5			15			5		5	35		25		15						5		15			
Poa.spp																						25			
Ach.mil	5		5	5		5			5		5	5	5	5							5				
Aga.foe															5		5				5	5			
Ago.gla		5								5				5	5	5		5	5		5			5	
Ane.cyl		5		5																	5				
Ane.mul												5												5	
Ant.spp							5						75			25		65		65			35	35	65
Cam.rot	5	5	5				5			5					5		5	5			5				5
Com.pal	5	5	5			5	5	5	5							5	5	5			5				
Eri.spp	5		25	15		5					5	5	5					5					5		5
Fra.vir						5					5	5				5			5			5	5	15	5
Gal.bor	5	5	5	15		15	15	15		5	15	5	5		5	5	5	5	5		5		15	5	15
Geu.tri														5											
Hed.alp	5	5	5	5			5	5								5				5				5	
Lat.och	5	5	5			5		5		5		5		5		5	5		15		5	5	5		
Lil.phi																5									
Mai.ste													5							5					
Oxy.cam						5																			
Sis.mon										5				5					5						
Sol.mis	5		5	5			5	5	5	5		5	5	5	5	5		5	5	15	5		5		
Sym.lae						5		5		5	5	5	5	5	5	5	5		5		5	5		5	5
Tha.ven	5	5				5	5			5				5	5		5			5	5	5	5	5	
Vic.ame	5	15	5	5			5		5	5	5	5	5		15			5	5			5		15	
Vio.adu			5	5			5																		
Arc.uva		65				65		85			85					35	5								

Pop.tre	5					5																			
Ros.aci	5	5		5					5			5							5				5	5	5
Sym.occ									25						15						5		15		
litter							15						5				15	5		5					5
bareground			25	35							5					5					5		5		

1975.1172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	35	5					5				15														
Bro.spp								55				15	35	15	25	35	35	5	25	15	15	25	15	15	
Ely.spp	15		25	15	15	15	15				15	35													35
Ely.vil															5	5				15					
Fes.hal	35	5																							
Koe.mac							5				15														
Ach.mil	5	5	5	5		5	5					5			5						5				
Aga.foe			15			5																			
Ago.gla			5																						
Ane.mul		5																							
Cam.rot				5	5	5	5				5			5											
Com.pal						5																			
Eri.spp		35					5			5			5												
Fra.vir	5		5	5	5	5	5	15		5	15	15	15	5	5		5	5			5	15		5	5
Gal.bor	5	5	5		15	15	5	5		5	5	5			5	5	15		5	15		5		5	5
Hed.alp					5					5		5						5							5
Heu.ric							5						5							5					
Lat.och			5	5		5					5								15	5	5	5		5	15
Lil.phi																						5			
Mai.can														15	5								5		
Sol.mis	5	5	5		5	15	5																		
Sol.rig										15					5	5		5				5			
Son.spp				5																					
Sym.lae	5	5	5	5	5	5		5		5		5		5	15	5				5		15		5	5
Tar.off																	5					5			
Tha.ven			5	5	5	5	5							5	5	5		15	5	5	15	5		5	5
Vic.ame	5					5	5				5		5		15	5	5			15		5			5
Vio.adu				5	5	5						5	5	5			5				5		5	5	
Ziz.apt			5																						
Zyg.ele			5				5																		
Arc.uva			65	35	75	45	25						25							15	15				
Pop.tre		15		5	5	5	15	5		5	5	5	5	5		5	5	5	5	5	5	5	5	5	5
Pru.vir																		5					5		
Ros.aci		5			5			15		15	25		25	25	15	25	25	15	15			5	15	15	
Sym.occ	5						15						5				5	5	5				5		15
litter		15		15				15		25		15	15	25	25	15	25	55	25	15	25	25	45	45	5
bareground				5			5																		

1975.1181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																								5	
Agr.sca								5	25									5				15	5		
Car.spp										5				5	5				5						
Ely.spp	5	15	15	15	15	15	25	25	15	5	5	15	25	35	25	15	5	5	5	5		15	15	15	15
Ely.vil						15					15			5											
Fes.hal	75	65	15	65	25	5	35	35	25	5	25	35	35		15	35	5	15	5	25	55	25	25	35	35
Hes.spp												5					15	45	5		15	15			
Koe.mac	5						5	15								5				5	5				15
Poa.spp										15									5					5	
Ach.mil	5				5	5	5	5	5	5						5		5		5					5
Ago.gla	5	5	5		5		5			5						5							5		
Ane.cyl			5	5																					
Ant.spp					25										15					5					
Ara.hir				5																					
Art.lud												5					5				15				
Ast.lax																				25					
Cam.rot		5		5						5							5		5		5		5	5	
Com.pal									5				5	15	5								5	5	5
Eri.spp				5		5		5			5				5										
Fra.vir								5	5																
Gal.bor	15	5	15	5	5	5	5	5	5	15	5			15	5		5		5			15		5	
Geu.tri								5				5									15	5			

Hed.alp																	5		5				5	15	
Lat.och	5	5	5	5		5		5		5				5	5				15				15		
Lil.phi												5													
Mai.ste	5																	5							
Muh.obl																			5						
Ort.sec																15					5				
Oxy.cam				5	5				25	5					5			25			5		5		
Pot.arg	5																								
Sis.mon		5					5															5	5		
Sol.mis			5	5	5				15	15		5	5	5	5	5								5	5
Son.spp												5	5				5								
Ste.lon			5														5								
Sym.lae	5				5											5									
Tha.ven	5	5	5	5		15	5	5	5				5	5	5	15			5				5		
Vic.ame		15	5	5	5	15	15	5			45	15	5	5		25	5				15	5		15	5
Vio.adu	5		5				5	5	5	5			5		5							5			
Zyg.ele	5	5	5				5	5	5																
Arc.uva		75			15						45			5									75	15	
Pop.tre	15													5									15		
Ros.aci				5	5											5	5	5		5					
Vac.cae				5	15												65			15		5			25
litter													15	35	25					15					
rock				5						5															
bareground			5	5	5	25									5				5						

1975.1182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																						5	15	15	
Agr.sca			15	15	15			5			15	5	15	15				15			5				25
Car.spp		5	5																						
Ely.spp	15	25	25		5	5	25		25	15	5	15	15	15	15	25		15	15	45		15	15	15	25
Ely.vil																		5	5	15					
Fes.hal	25			15	5	15		15	15		35					25	15	35	25	15	55	45	45	45	15
Hel.hoo					5					15															
Koe.mac	25			5	15	5	5		5																
Poa.spp																						15			
Ach.mil		5							5		5	5			5	5			5	5					5
Aga.foe															15										
Ago.gla		5	5					5	5	5	5			5		5		5	5	5				5	
Ane.cyl																					5				
Ane.mul											5								5	5				5	
Art.lud																					5				
Cam.rot	5			5		5		5	5			5	5	5		5					5		5		
Com.pal	5	5	5		15		5	5	15	15	15	5	15					5	15	5			5	15	
Eri.spp					5													5				5			
Fra.vir									5					5	5		5								
Gal.bor	5	15		15	5		5	15	5	5	5	5		15	5	5			5	15	5	5		5	5
Geu.tri										5															
Hed.alp					5				5	5			5	5	5					5	5	5		5	
Lat.och				15	5		5	5		5		5	5	15	5		15						5	5	
Lit.can									5																
Oxy.cam			5					15				5			5				15	15			5		
Sis.mon																		5	5						
Sol.mis		5	15	5	5	15	5	5	5		15		5		5	5			5	5	5	5	5		
Son.spp					5			5	5		5						5		5	5			5		
Sym.lae		5	5	5			15	5			5	5		5				5	5			5			
Tha.ven	5	5		5	5		5		5	5	5	5	5		5	5			5						
Vic.ame	25	15	15	5	5	35	5	5	5	5			5	5			15	5		5	5	15		5	
Vio.adu		5		5	5		5	5				5			5			5	5	5					
Zyg.ele			5			5			5														5		5
Arc.uva				55	65		55	15	35	35		35	85	65	85		15			5				35	
Pop.tre		15			5	15	15									25	85	5	25			5	15	5	15
Ros.aci	5		5	5			15	15	25		5			5				15	5						
Sym.occ	5			5																					
litter			15																						
rock									5	15				15								5			
bareground												15										5			

1975.1271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**

Agr.sca		45		25		25			15		15	25										25	25		
Car.spp							5	5		5			5						5	5			5	5	5
Ely.spp	45	25	25	45	35	5	35	5	15	25	25		15	5	5		5	25		15	5	5	15	15	15
Ely.vil									5	5															
Fes.hal			5	5	5		15	55	35	15	5		25	15	85	5	45	15	65		65	25	5	35	25
Hes.spp								15							5	5									
Hie.odo						15																			
Koe.mac	25										15			25									25		15
Poa.spp			15				25		15				15	35				45	15						
Ach.mil	5	5	5	5	5			5	5		15		5	5	5				5				5	5	5
Aga.foe								5						5											
Ago.gla										5							5		5					5	
Ane.cyl									5																
Ant.spp																					15				
Art.lud		5							5			15			5	25				5					
Cam.rot			5			5	5	5	5			5	5	5		5			5			5	5		5
Com.pal									5			5							5			5	5		
Eri.spp					5		5		5									5					5		5
Fra.vir	5						5							5				5							
Gal.bor	5	15		5		5				5	5			5	5	5	15	5	15	5	5	15			5
Geu.tri	5															25			5			5			
Hed.alp		15															5							5	
Lat.och		5	25						5	5					5		5	5	5					15	
Lit.can																					5				
Mai.ste	5	5	5						5	5				5						5				5	
Oxy.cam																					5				
Pol.sen	5																								
Pot.arg																		5							
Sis.mon	5		5							5							5		5			5			
Sol.mis					5				5									5					5		5
Son.spp						5									5		5			5					
Ste.lon	5																								
Sym.lae	15	5	15	5			5		5	5	5		5				5	5			5				
Tar.off														5											
Tha.ven		5		5			5	5	5	5	5			5			5			5		5			
Vic.ame	5	5	15		15	5	15	15			25	5	25		5	15			5			5		5	
Vio.adu																							5		
Pop.tre	5		5										35	25											
Ros.aci		5	5						5		5				5	5					5				
Sym.occ				15	15	35	5	5		5		5	5				5	25	15	65	5	5	5	25	5
litter																									15
rock																						5			
bareground																	15						35		

1975.1272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		35			15	5			5	5			5	5		5	15							25	
Car.spp																	5			15					
Ely.spp		5	5	45	25			25	25		25	15	15	35	25	5		85	15	15	15			15	15
Ely.vil																			35					25	
Fes.hal			15		15							35			35					15	5	25	5		35
Hel.hoo						15																			
Hes.spp	35	35															15				15	35	55		
Hie.odo											15						5								
Koe.mac	5					25	15	25								15	15								
Poa.spp								5																	
Ach.mil	5	5	5	5	5	5		5			5	5			5		5	5	5		15			5	25
Aga.foe						5																			
Ago.gla			5						5			5			5		5								5
All.spp																							5		
Ane.cyl			5																						
Ane.mul									5			5													
Art.lud																						15			
Cam.rot					5									5			5				5	5	5		5
Com.pal		5	5						5			5			5		5		5			5			
Eri.spp			5								5	5							5						
Fra.vir				5		5			5				15	5		5				5					
Gal.bor	5	5	5	5	25	5	5	15	5	15	5	5	15	5	5		15	5	5	5	15	15	15	5	5
Geu.tri											5														
Hed.alp	5		15					5		5				5				5	5						
Heu.ric										5				5											

Lat.och			5			15		5	5	5		5	5	15	5	5		5						5	
Lit.can			5						5			5													
Mai.ste				5			5								5	5		5			5		5	5	
Oxy.cam												15													
Sis.mon																					5				5
Sol.mis					5							15		5	15		5		5	5	5				5
Sol.rig						5	5	5								75	5								
Son.spp					5	5									5										
Sym.lae				15	5			5	5				15	5		5			5	5				15	
Tar.off											5														
Tha.ven	5		5		5	5	5		5	5			5	15	5	5	5	5		5				5	5
Vic.ame	25	15	15		5	5	5				15	15	5		5	5		15		5	5		15		15
Vio.adu									5		5	5	5	5						5					
Zyg.ele	5																			5					
Arc.uva			45						65	85			25	35											
Pop.tre			5	45		15	65	35			5					5			5	5					5
Ros.aci	5	5		5		5				5	5		5						5	5	15	5		5	
Sym.occ	45	25	5	5	15	15	5	15	15	5	25				15		25				5	5			
litter																			15	35					
bareground					5						15										15				

1975.1281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca					5	15			15	15		15							15			5		15	25
Ely.spp	15	25			55	55	5	15	5	55	15	15	15	35	5			15	15			5	25	5	15
Ely.vil	55	5		15									15												
Fes.hal	5	5				5	5	15	5	15	25	25	15	5	45	5	5		25	15	5	15	5		
Hes.spp															15	85	75	65		5					5
Hie.odo	5				5									5	15										
Koe.mac		15	35	45	5		35		25		5			5			5				5				
Poa.spp							15	25	5										5	5					
Ach.mil	5	5	5	5	5	15	5	5	5	5			5	5	5		5		5				5	5	
Aga.foe									15																
Ago.gla		5									5	5	5		5							5		5	
Ane.mul															5										
Ara.hir														5											
Art.cam									5													5		5	
Art.lud								5		5	5	5					25								
Cam.rot	5	5		5	5		5	5		5	5			5	5			5	5	5	5		5	5	5
Com.pal																							5		
Eri.spp	5			5			25	5					5	5	5		5	5			5			5	5
Fra.vir		5	5	5					5																
Gal.bor		5	5	5	5		5	5	15		5	5		5	5	5	5		15		15	15	5	5	
Hed.alp				5																		5		5	
Lat.och		15	15	15																					
Lil.phi																						5			
Mai.ste					5			5			5		5	5											
Ort.sec	5																								
Oxy.cam																5									
Pot.arg			5																						
Sis.mon								5			5	5				5	5	5	5						
Sol.mis	5		5	5			15		15				5	5					5			5	5	5	
Son.spp																		5							
Sym.lae	15	5	5	5																					
Tar.off											5														
Tha.ven	15		5	5	5		5	5	5	5	15			15	5			5	5	15	5	5		5	5
Vic.ame	5	15	25	25	25	5	25	35		5	15	5	15		15	5	5	5		5	25	15	35		15
Vio.adu										5			5											5	
Zyg.ele				5																					
Arc.uva															5										
Pop.tre						15			5				5			5						5			15
Ros.aci	5				5	5	15							5	5				5	5	65		5		5
Sym.occ	5	25	5				5			5		15				5					5				
rock				5																					
bareground				5		15	5	5												25				5	5

1975.1282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric	5																								
Agr.sca		15																					35	35	

Bro.spp						5	65	25	85	75		35	25		25					5					
Car.spp																				15	15				
Ely.spp	25	35	15	25	15			5			55			15	5	55	35	35	15	5	15	15			25
Ely.vil			15									15	15				35	25					35		
Fes.hal																							15		
Hel.hoo																			15	5					
Hes.spp																		5							
Hie.odo																					15				
Koe.mac	5		15															5			55			25	15
Poa.spp							5																		
Ach.mil				5	5						5	5	5		5				5	5		5	5	5	
Aga.foe						5																			
Ago.gla				5																					
Ane.cyl												5	5												
Ant.spp					25																				
Cam.rot	5	5		5				5			5					5	5	5			5		5		
Com.pal				5	5																				
Eri.spp								5				5													
Fra.vir			5	5	5	5		5	5	5	5	5	15		5		5		5	5		15	5	15	5
Gal.bor	5	5	15	5	15			5	5	5			5			15	5	5		5	15			5	5
Geu.tri								5																	
Hed.alp																	5								
Heu.ric													5												
Lat.och											5				25				5			5	5		15
Lit.can							5																		
Mai.ste						5		5											5						
Oxy.cam		5			5						15					5				5					
Sol.mis	5				5												5					5	5	5	5
Sol.rig										5		5	5		5	5			5						
Son.spp	5		5																						
Sym.lae					5	15		5	5	5	5	5	5		15						5	5		5	5
Tar.off													5												
Tha.ven		5	5	5	5	15	15		5	15	15		15	5	15		5		5	5	5	5	5	5	
Vic.ame	15	15		5			5		15	5				15		5	5	5		15		5	15		5
Vio.adu		5		5	5					5							5	5					5		
Arc.uva				75			5									65				65					
Pop.tre	15	55	55	5	25	35	15	5		5	5		5	25	15		5	5	5	5	15	5	15		
Ros.aci			5			5		5		15	5	15		45	5	15	5	15	25	15		25		5	5
Sym.occ	15								15							5	15	5	15	15	5				15
litter												15	15	15		15		15				15			
bareground																							25	25	

1975.2112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				5	15					55															
Agr.sca											5				25	25				25	55				
Bro.spp	5		15	5		25					15	5	25		15		5		15		15	5			
Hel.hoo	15	15	15			15	5						25	15	25	35	35	25	15	5		25	35	15	
Hes.spp																									25
Hie.odo				15		25		5	25	5															
Koe.mac																								25	
Poa.spp																		25							
Ach.mil									5	5		5		5	5	5			5	5			5	5	5
Aga.foe				25					5																
Ago.gla										5															
Ane.cyl									5													5			
Cam.rot				5						5				5									5		
Epi.ang	35	15	35	5	25	5	15	25		5	5	15	5	25		5									
Fra.vir	5	5	5			5	5		25		15	5							5						
Gal.bor	5		5	5	5	5	5	5	15	5		5	5	15	5	5	5				5	5	5	5	5
Geu.tri																5									
Hed.alp															5			15		55					
Heu.ric						5																			
Lat.och		5	15	15	5	5		5	5	15		5	5	5		5	5	5			5		5	5	5
Mai.ste	5	5	5	15	5	5	5	15	5	5	5	5	5	5		15	15	5				5	5		
Sol.spa					35	15											5		35					5	
Sym.lae			5				5	5			5	5		5	5			5		15		5	15	5	15
Tha.ven	5	5	5			5	5	5	5	15	5	5	5	5		5	5		5	5	5	25	15		5
Vic.ame				5	15		5	5			5		5	5		5	5			5					
Vio.adu				5	5		5	5	5			5		5			5			5	5	5	5	5	
Arc.uva		5																							

Pop.tre	5	5	5		5		5	5		5	5				5		5	5	5		5	5		5	5
Ros.aci	5	15				5	15	15			15	15	5	15	5	15	5		5	5	15	15	5	5	5
litter	25	35	25	15	15	5	55	25	25		15	45	35		15		25	15	15		15	15	15	15	
bareground																								25	25

1975.2171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric					5																				5
Agr.sca		5					5			25	5	15		15	45	25					5			15	
Bro.spp						5					5														
Ely.spp		25	25	15			15	15	25	5			5		15	15	25	25	15	5	5	15	15	5	15
Ely.vil							25	5										5				5			
Fes.hal	75	25	65	75	75	85		5			65	15	35	65	5	25		25		65	15		15		
Hel.hoo																				5					
Koe.mac		5		5			25		15	15	5			5					75		25		15	15	
Poa.spp		15							25	15			25		5										
Ach.mil	5	15			5	5		5	5	15	5	5	5	5		5	5	5		5	5	5	25	5	
Aga.foe		5					5						15												
Ago.gla								5		5		5		5	5					5				5	5
Ane.cyl										5															
Art.lud					5												5				5	5	5		
Cam.rot	5			5			5	5	5						5		5	5	5		5	5	5	5	5
Eri.spp		5		15						5							5				5		5	5	
Fra.vir	5		5					5												5					5
Gal.bor	5	5	5	5	5	5		5					5	15	5		5			5					5
Hed.alp																								5	
Lat.och			15			5	15		15			5	5		15				5	15		5	5	25	
Lit.can									5																
Mai.ste	5										5								5			5			5
Mon.fis													5												
Muh.obl	15	5			5		5		5		5					15									
Sis.mon			5											5	5					5			5		
Sol.mis								5			5						5							5	
Son.spp	5						5	5	5	5	5	5			5			5	5	5			5	15	5
Sym.lae				5	5	5	5	5	5	25		5	5	5	5		5				5				
Tar.off																						5			
Tha.ven	5	15	5		5	5		5	5	15		5	5		5	5	5	5	5	5	5		5	15	5
Vic.ame	15	5	5	15	5		15	25	5	5	5	15	5	5	15	15	15	25	15	5	25	25	5	35	
Vio.adu	5																	5	5						
Zyg.ele					5				15				5												
Pop.tre							15			5		15								5		5		5	5
Ros.aci		25				5					15		5	5	5	5	5		5		5				
Sym.occ			15	15	15	5		5		5		25	15	15		5	25	15	5	5	5	35	5		15
litter								15																	25
bareground														5									25		

1975.2172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5					15					15								15	25			35	25	
Bro.spp		15	25	15	5		35	15	15	15				5	15										
Car.spp																5						5		5	5
Ely.spp	25	15				35	15				35	55	45	35		25	15	15			35	25		15	25
Ely.vil		5	5															25					25		25
Fes.hal											15					25	35				15	15	5	15	15
Hes.spp																					25				
Koe.mac																						25	15		
Poa.spp																15									
Ach.mil	5				5		5				15	5		5		5	5		5		5	5	5	5	5
Aga.foe		15										5													
Ago.gla																5									
Ane.cyl												5													
Art.lud																									15
Cam.rot																	5	5	5					5	
Cor.can					15																				
Eri.spp	5																					5			
Fra.vir	25	15			5	5	5	5	5	5		5		5	5	5		15	5	5			5		
Gal.bor			5	5	5	5	5		5	5	5		15				5		15	5				5	5
Hed.alp		5	5			5						5						5					5		
Lat.och	5	5				15		15	5	5	15	5	5	5					5		5		5		
Lil.phi																5									

Mai.can			5	5	5			15	5	5					15										
Mai.ste	5													5					5			5			
Oxy.cam																								5	
Pyr.asa					15																				
Sol.mis	5															5	5				5			15	5
Sol.rig					5				5	5	5			5					5	5					
Sym.lae	5	5	5			5	15	5		5	5	5	5	15	25	5	5	5			5	15	5		
Tar.off						5																			
Tha.ven	5							5			5	5	5			5		5	5	15		5			
Vic.ame	15				5		5	5		5	5	5	15	15	15	15					5	5	5		5
Vio.adu									5		5	5			5										
Zyg.ele																									5
Arc.uva												5			5										
Pop.tre		5				5	5	5		5	5	5	5	5	5	5	5	5	5	5					
Pru.vir									15																
Ros.aci		15	25	75	25			15	15		5			15	15		5	15	35	5	15	5	5		
Rub.pub			25	5						5															
Sal.beb				35	5				5	5															
Sym.occ	5																15				5		5	5	5
litter				15	5				5					5	15					15					
rock																								15	
bareground																	5						5		

1975.2181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric															5				35	15	5				
Agr.sca														5											
Ely.spp	35	35	15		15	15						5	5		25	15	35	35	35	5		5	15	5	15
Ely.vil	55	5	25	5	15	25		55	55	25	65	5	85	15	25	5									5
Fes.hal							45	5	5	15		35		5	25		35		5	45		25	25	35	15
Hel.hoo																						15			
Hes.spp												5										25			
Koe.mac		25	25	35	45		5			15						25	5	5			45				
Poa.spp	25					15	5				25		5							5					
Ach.mil		5		5	5		5	5		5				5		15	5	5	5		5	5			
Ago.gla										5				5	5				5	5			5	5	
Ane.mul																	5						5		
Art.fri		5																			15				
Art.lud											5							15						5	
Cam.rot		5		5		5	5				5	5	5		5		5	5	5		5	5	5		
Com.pal									5																
Eri.spp				15				5	5	5		5								5		5		5	
Gal.bor	5	5	5	5	5	55	5	5	15	5	15			5	5		5	5	5		25	5	5		5
Geu.tri			25				15					15					5						15		
Hed.alp			5				5					15	15		15					5					5
Lat.och				5	5			15						5										5	15
Mai.ste					5				5					5	5	5								5	5
Oxy.cam					5		5	5											5						
Pol.sen				15																					
Pot.pen																						5			
Sis.mon		5							5						5		5	5	5			5			
Sol.mis								5	5			5		5			5			5			5	15	5
Sol.rig				5	5																				
Son.spp														5											
Sym.lae				5																					
Tha.ven		15	5	5	5		5	5	15	5				5	5	5		5	5			5	5		5
Vic.ame	15	15	5	15	15	15	15	5	15	15	15	5		25	5	55	15	15	15	5	5	15	15	5	15
Vio.adu					5		5	5		5							5	5			5				
Arc.uva			25				15							55				25			25				15
Pop.tre		5	5					5	5															5	5
Ros.aci		5																			5				
bareground													5										5	5	

1975.2182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca			25			15					25					5									
Bro.spp								15	5	75			5	15	55	15	5	15	15	15	25	5	35		
Car.spp	5	5				5	5				5	5													
Ely.spp		5	5	15	5		15	5	15		5	25	5			15	5				5	15		25	
Ely.vil												15			25	15						5	15	25	5

Fes.hal	25	25	35	15	35	35	15	15	15		25	15									35				
Hes.spp	15	15	5	35	35		15		55		5														
Hie.odo						35	5	35			15													15	
Poa.spp		15				15																			
Ach.mil	5	5	5	5	5	5	5	5	5	5		5									5		5	5	
Aga.foe	5																								
Ago.gla		5		5	5											5					5				
Art.lud		5	5	15			5		5	5	5	5										5			
Cam.rot		5		5	5	5	5					5				5	5				5			5	
Com.pal																5					5		5		
Eri.spp											5					15					5		5		
Fra.vir														5	5			5	5						
Gal.bor	5	15	5	5	5	5	15	5	5		5			5	5	5		5	5	5	5	5		5	5
Geu.tri			5								5														
Hed.alp																								5	
Heu.ric																			5						
Lat.och	15	5								5			5	5	5		5	5			5	5	5		
Mai.ste										15					5					5				5	5
Oxy.cam					5		5																		
Sol.can																								5	
Sol.mis					5	5	5	5			5														
Sol.rig														15			75	15	5			5			5
Sym.lae										5		5						5	5			5	5	5	5
Tar.off													15	5			5	5							
Tha.ven	5	5				5	5	5		5		5	5			5	5		15	5	5		5	5	
Vic.ame	5		5	15	5		5		15		5		15			5	5			5			5	15	5
Vio.adu			5						5	5								5			5	5			
Zyg.ele					5	5		5																5	
Arc.uva	25												25												
Bet.spp																									85
Pop.tre											5	5	5	5		5						5	5		
Ros.aci	5							15	5	15			5	15						35		5			
Sal.beb																								15	
Sym.occ			15					15																	
litter														25				15	15	15					
rock							5				5														
bareground		5	5																						

1975.2212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp	15		15	25	15	5	15	25	25	15	25	5	35	25	25	25	25		25	15	35		25	35	75
Ely.spp		15	5		15			25	25	25								5							
Ely.vil	25	15				5					35	15		35			5	15				25			
Hel.hoo			35		35					25												15		5	
Koe.mac															15		15			15					
Ach.mil	5	5	5			5	5		5	5	5		5	5	5	5	5	5		5		5		5	5
Aga.foe												15													
Cam.rot	5		5				5					5									5	5			5
Com.pal														5											
Eri.spp																						5			
Fra.vir	5						5		5				5			5	5	5					5		
Gal.bor	15	5	5		5	5	5	5	5	5	5	5	5	15	15	5	15	15	5	15	5	5		5	5
Geu.tri							5						5								5	5			
Hed.alp												5	5												
Heu.ric		5				5	5									5				15					
Lat.och	15	15	5		5	35	15	25		15	5	5	15		5	15	15	5	5	5	5	15		5	5
Lil.phi																								5	
Lit.can													5												
Mai.ste			5					5					5		15										
Sol.rig															5			15	5	25		15	5	15	5
Son.spp						5								5											
Ste.lon																	5								
Sym.lae	5		15		5		5		15		5	25		5		5	5	5	5	15	5		5		
Tar.off				5					5																
Tha.ven		5	5	5	15	5	5			5	5						5	5		5			5	5	
Vic.ame	5	5		5	15	15		5		5	5		5	5	5	5	5	5		5	5		5	5	15
Vio.adu			5																5		5				5
Ziz.apt													5												
Zyg.ele																								5	
Arc.uva		25				15	15				15	25				25						75			
Bet.spp																			15	15	55		35	5	5

Pop.tre	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5		
Ros.aci		15	5	45	5	5																	5		
Sal.beb						25																			
litter	15	15	5	25	15		5	15	15	5	15	15		15	5	5	5	25	15				5		5
rock																		15							

1975.2271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																						35			
Agr.sca																			5					5	
Ely.spp	25	15				55	35	55	25	35	25		55	55	25	5	15	15	15	25	15	15	35	5	
Fes.hal	5	5	75	85	35	5	15		15		45	5	5	5		65	25	55	5	15		25	15		5
Hel.hoo																		15							
Hes.spp						5	5							5	25					35			5	65	55
Hie.odo																								15	
Koe.mac	5					25	5			5		15		15	15	15			15		15	25	5	15	5
Poa.spp									5				15												
Ach.mil	5	5	5	5	5		5	15				5		5		5	5	5	5	5	5		5	5	5
Aga.foe																					15	5			
Ago.gla										5					5			5		5		5	5		5
Art.lud		5				5	15					15	5				25				5			15	
Cam.rot							5	5	5	5	5	5	5			5	5					5			5
Com.pal								5	5									5							
Eri.spp						5								5			15	5	5				5	5	5
Fra.vir																					5				
Gal.bor	5	15	5	5	5	5	5	5			5	25			5	5	5	5	5	5	15	5		5	15
Geu.tri															5										
Hed.alp																		5							
Lat.och									15	15			5								5	35	15		
Lil.phi								5																	
Mai.ste							5	5	5			5	5	5						5		5			
Muh.obl																							5		
Oxy.cam	5											5							5	5					
Pol.sen	5																								
Sis.mon	5					5		5			5														
Sol.mis	5													5					5	5		5		5	
Son.spp					5								15	5					5		5	5	5	5	
Ste.lon	5									5															
Sym.lae	5					5			5	5	5									5	5				
Tha.ven							5	5	5		5	5	5	15		5			5	5	5	5	5	5	5
Vic.ame	25	15	15	15	25	15	15	15	5	15	15		25	15	15		5			5	5		15	15	55
Vio.adu	5											5								5				5	
Arc.uva		75																							
Pop.tre				15	25		5			5															
Ros.aci		5	25		5		5			5						5		5				5		15	5
Sym.occ	5	15		15	15		5		15	15		5		5	45	5	5	15	55			15			
rock	5																				25				
bareground								15									5								

1975.2272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca											5									15					15
Bro.spp					15		15	35			15	15	35	15		15									
Car.spp																							5		
Ely.spp	25	15		15	25	15				25	25	15			25			15	25	15	5	15	25	25	35
Ely.vil									65					25		15	15						25		
Fes.hal	15	15	55	15	25	15				15					25					5	45	25	15	25	35
Hes.spp	15	25	15												15					35	5	5		15	
Koe.mac																					15	5		5	
Poa.spp							15	5				15									15		5		
Ach.mil	5	5		5	5	5	5		5	5	5				5				5	5	5	5		5	
Ago.gla					5				5						5								5	5	5
Cam.rot				5	5		5	5												5		5			5
Com.pal	5		5	5	5					5													5	5	
Eri.spp			5																		5			5	5
Fra.vir							5	5	5				5												
Gal.bor	5	5	15	5	5	15	5		5	5	5	15	15	5	5			5	5	5	5	5		15	5
Hed.alp							5		5						5		5								
Heu.ric		5											5												
Lat.och	5	5				15		15	5	5	5			5					5				5		5

Mai.can													5										5		
Mai.ste		5						5					5						5						5
Muh.obl																	5								
Oxy.cam		15													5						5				
Pot.arg																						5			
Sol.mis	5	5	5	15	5					5											5	5	5	5	5
Sol.rig							5	5			15	25	25					15	5						
Son.spp																5									
Sym.lae						5	15	5	5	5	5		5	25			15	5					5		
Tar.off																				5					
Tha.ven	5	5				5			5	5	5	5	5	5		15	5	5	5				5		
Vic.ame	5	5	15	5	5	5		5		5			5		5		15	5	15		5		5		5
Vio.adu	5	5	15	5	5	5	5	5			5											5			5
Zyg.ele		5																		5					5
Arc.uva						5											5								
Bet.spp																5	5	5							
Pop.tre	5								5		5	5	5	5		5		5	5						
Ros.aci	5	5		5		5						5		5	15			5		5	15	15	5		5
Sym.occ	5																								
litter											15		15					5							
rock				25											5							15			
bareground																						15			

1975.2281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		15						35				25						5							
Car.spp		5																							
Ely.spp	15	5			75	75	55	15		25	55	5	5		45			15	25	25				15	25
Ely.vil			65																						
Fes.hal	15						25		55	15		45	25	15	15		35		5	15		15	15	25	25
Hel.hoo										15														15	
Hes.spp												15													
Hie.odo			5				5							15											
Koe.mac		75			15	5		15	5	15	55			25	25	15	25	35	15	35	15	35	35		15
Poa.spp	25			65			15			5				15	15		25		15				15	25	
Ach.mil	5	5		5	5	5		5		5	5		5	15	5	5		15		15	5	5	5	5	5
Aga.foe		15				5						15				15	5	5			5	5	5		
Ago.gla								5	5				5	5				15	5			5	5	5	5
Ane.cyl																							5		
Art.cam					5																				
Art.fri																					5				
Art.lud																						5			
Cam.rot	5	5	5	5	5	5	5	5	5		5		5		5		5		5	5		5	5	5	
Cir.arv						5																			
Com.pal				5				5				5	5		5			15	5					5	5
Eri.spp				5					15	5	5				15		5			5		5		5	
Gal.bor	5	5	5	15	5	5	5	5	5	5	5	5	5	5			5	5	5	5		5		5	5
Geu.tri										15												5			
Hed.alp	5										15										5				
Lat.och	5					15	5	5			5	5				5	5				15				
Mai.ste																		5							5
Oxy.cam									5																
Pol.sen		5									5														
Pot.arg						5																			
Sis.mon						5			5		5			5				5							5
Sol.mis			5			5	5	5	5	5	5				5	5				5					
Sol.rig							5																		
Son.spp	5											5													
Sym.lae			5			5		5						5		15		5							
Tar.off																							5		
Tha.ven	15		15	5	15	25	5	5	5	15	15	5	5	5	5		5			5			5		15
Vic.ame	5	15		25		5	15	15	15	15	5	15	15	5		5	5		25	5	5	5	15	15	
Vio.adu								5					5				5					5			
Ziz.apt											5					35									
Arc.uva																25									
Ros.aci	5		15												5			5			5	5	5	15	5
Sym.occ					5										5		5								
bareground								15					5					5		15		15			

1975.2282	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ach.ric							5																		
Agr.sca																					35				15
Bro.spp	35					35					35	15		15		15			45						
Car.spp		15			5		5		5	5										5					
Ely.spp	35	15		35	45		35			15		25	15		15		25				15		35		15
Ely.vil						5								25				15							
Fes.hal		25			15					35										65		5	5	35	35
Hel.hoo			15																						
Hes.spp		15			15	15		5	45	35					15	15						35	25	15	
Koe.mac																		25	15			5	15	5	
Ory.spp				15			35																		
Poa.spp																15				15		15			5
Ach.mil	5	5	5	5	5	5	5			5	5		5	5	5		5	5	5		5	5	5	5	5
Aga.foe	15													5					15				5		5
Ago.gla		5			5				5						5			5		5	5	5	5	5	5
Ane.cyl				5																					
Cam.rot		5			5					5			5					5		5	5	5			
Com.pal															5			5							5
Eri.spp				5	5								5					15		5	15				
Fra.vir		5	5			5	5	5	5		5	5	5										5		
Gal.bor	5	5		5	5	5	5		5	5	5	5		5	5		5	5	5	5	5	5	5	5	
Geu.tri	5	5								5															
Hed.alp								5							5							5			5
Heu.ric																	5	5					5		
Lat.och		5		5					5	5	5				5	5	5	5	5			5	5		
Lil.phi																	5					5	5		
Mai.ste	5	5	5					5	5	5	5	5		5		5	5	5			5		5	5	
Pot.arg								5			5					5								5	
Sol.mis																15		5		5	15				
Sol.rig			5	5							5		15												
Son.spp					5																				
Sym.lae	5	5	5			5	5	5	15			15	5		5			5	5	5			5	5	
Tar.off			5	5																					
Tha.ven	15	5	5	15	5	5	15		5	5	5			15	5	5		5	5	5		5			5
Vic.ame					5	5	5		5	5		15	5	15	5		5		5	5		15		15	
Vio.adu	5	5					15							5		5					5			5	
Zyg.ele							5																	5	
Arc.uva		5				25			25	65			25		25										
Bet.spp			5		5			5																	
Pop.tre		5		5		5		5		5	5	5				5		5	5					5	
Ros.aci	15	15		15	15	5		5								5					5		5	5	
Sal.beb											5			5											
litter			75					85			5		15	5				5							
bareground																5					5				

1975.3111	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Bro.spp	25	35	5	5	35	55	55	25	55	55	55	45	25	75	15	35	85	55		15	15	35	65	25	5
Ely.spp	15																5								
Ely.vil	15		35	35	15			25							35					25				25	55
Ach.mil	5	5				5		5		5				5	5	5	5			5	5	5			5
Ago.gla			5												5										
Ane.mul				5				5																	
Cam.rot															5					5					5
Com.pal			5												5										5
Fra.vir	5	5	5		5	5		5	5	5	5	5	5		5		5			5	5	5		5	
Gal.bor	5	15	5	5	5	5			5		5	5			15		5	5		15		5	5	5	15
Hed.alp	5		5	5				5	5					5	5		5			5				5	5
Lat.och		15	5					15	5		5			5			5			5	5			5	5
Lil.phi	5														5								5		
Mai.ste			5	5	5																				
Ort.sec												5				5					5				
Pot.arg					5																				
Sol.rig	5	5	5			5	5	25	5		5	5	5	5	5	15	5	5			5	15	15		
Son.spp																									5
Sym.lae	15	15	25	5	15	25	5	5	35	35	5	5		15	15		15			15	5	15	15		15
Tar.off																						5			
Tha.ven		5	5	5	5	5	5	5	5		5		5	5			5	5		5		5	5		
Vic.ame	5	5		15	15		5	5	5		5			5								15	15	15	
Vio.adu			5		5																				

Arc.uva	15	15				25														5					
Bet.spp	5	5				5	5		5	5	5	5	5		5			5		5	5	5	5	5	
Lon.dio																5						5			
Pop.tre			5	5	5		5	5		5	5	5		5			5			5			5	5	5
Ros.aci			5	15			5						5					15			15				
Sal.beb				5	5						5	5	5			5				5					
Sym.occ											5	5	5			5									
litter												35	15			35		15			25				

1975.3112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp	55	45	65	35	65	65	65	75	65	65	55	15	75	85	65	55	55	45	65	75	15	25	55	65	25
Ely.spp					15																				
Ely.vil										15											75				
Ach.mil					5					15			5	5		5			5	5	5				5
Fra.vir	5		5		5	5	5	15		5	5			5	5	5	5			5	5	5		5	
Gal.bor	5			5			5	5					5					5		5				5	
Geu.tri										5										5					
Hed.alp								5													5				
Heu.ric								5	5				5												
Lat.och								5	5					15	5	5	5		5	5	5		15		
Mai.can		5																5							
Mai.ste			5									5	5		5										
Ort.sec						5	5										5								
Pot.arg			5																5						
Sol.rig	15	5	25	25	15	15	15	5		5	25				5	5	5		25		5	5			75
Sym.lae	5		15	5	5						5		15	5	25	5	5		15	15	5	5			5
Tar.off			5	5	5														5						5
Tha.ven	5	15	5	5	5	5	5	5	5		5		5	5	5						5	5	5	25	5
Vic.ame			5		5	5			15	5	5		5	5	5	5	5	5	5	5	5	5	5		5
Vio.adu	5				5				5	5				5									5		
Bet.spp		5		5				5	5			5						5				5	5	5	
Pop.tre	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5			5	5	
Ros.aci	25	15	5			25	5	5		15	15	25				5	15	5		15	15	5			
Sal.beb	5			5			5			5	5			5			5					5			5
Sym.occ											5														
litter												15						15					5		

1975.3211	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp				25	5	25			15	55										15					
Ely.spp	15	35	55				35	55			25		25		25	15	15	15	35		25	45	5	15	15
Ely.vil	55	25	15			25							5	5		25					25	35	35	15	
Ach.mil	5	5	5			5	5	5			5		5	5		5	5	5	5	5	5	5	5	5	
Ago.gla														5											
Ane.cyl			5																						
Cam.rot		5				5					5				5										
Com.pal							5				5			5		5	5				5	5		5	
Fra.vir		5		5		5		5			5		5	5	5				5				5		5
Gal.bor	5	5	5			5	25	5	5	5	15			5	5	5	15	15	15	15	5	5	5	5	5
Gen.aff		5	5															5	15						
Geu.tri		5		5	5	5			5	5															
Hed.alp		5	5				5									5	5	5			5	5			
Heu.ric																5									
Lat.och	15	5	5			5	15				5		5	5	5	5	5	5	15	5	5	5	5	5	15
Lil.phi						5					5		5			5		5	5						
Mai.ste						5										5									
Ort.sec					5				5																
Sol.rig		5	5	5	5	35	5	15		5			5	5	15					5			5		
Son.spp																		5				5			5
Ste.lon																								5	
Sym.lae	5	5	15	15	5	5	15	15	5	15	15		5	5	15		5	15	15	5	5	15	5	15	5
Tar.off											5														5
Tha.ven	5	5	5	15				5	5				5	5	5	5	15	5		5		5	5	5	5
Vic.ame							5	5		5			15	5	5	5		5		5		5	5		15
Vio.adu														5			5	5			5	5	5		
Ziz.apt																		5	5						
Arc.uva		25	5					25			45		55			55	85	85	45		55	5	75	65	
Bet.spp		5	5	5	5			5	5	5	5			5	5					5					5
Lon.dio									5																

Pop.tre	5	5	5	5		5	5	5	5	5						5				5	5	5	5	5	5
Ros.aci	5	5			5	5	5		5	25					5						15	5			
Sal.beb					5					5				5	5	5									5
Sym.occ				25																					
litter					35				55											15					
bareground		5						5											5					15	

1975.3212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp	25	35	5	5	35	55	55	25	55	55	55	45	25	75	15	35	85	55		15	15	35	65	25	5
Ely.spp	15																5								
Ely.vil	15		35	35	15			25							35					25				25	55
Ach.mil	5	5				5		5		5				5	5	5	5			5	5	5			5
Ago.gla			5												5										
Ane.mul				5				5																	
Cam.rot															5					5					5
Com.pal			5												5										5
Fra.vir	5	5	5		5	5		5	5	5	5	5	5		5		5			5	5	5		5	
Gal.bor	5	15	5	5	5	5			5		5	5			15		5	5		15		5	5	5	15
Geu.tri														5											
Hed.alp	5		5	5				5	5					5	5		5			5				5	5
Lat.och		15	5					15	5		5			5			5			5	5			5	5
Lil.phi	5														5								5		
Mai.ste			5	5	5																				
Ort.sec												5				5					5				
Pot.arg					5																				
Sol.rig	5	5	5			5	5	25	5		5	5	5	5	5	15	5	5			5	15	15		
Son.spp																									5
Sym.lae	15	15	25	5	15	25	5	5	35	35	5	5		15	15		15			15	5	15	15		15
Tar.off																						5			
Tha.ven		5	5	5	5	5	5	5	5		5		5	5			5	5		5		5	5		
Vic.ame	5	5		15	15		5	5	5		5			5								15	15	15	
Vio.adu			5		5																				
Arc.uva	15	15				25															5				
Bet.spp	5	5				5	5		5	5	5	5	5		5			5		5	5	5	5	5	
Lon.dio																5						5			
Pop.tre			5	5	5		5	5		5	5	5		5			5			5			5	5	5
Ros.aci			5	15			5						5					15			15				
Sal.beb				5	5						5	5	5			5				5					
Sym.occ											5	5	5			5									
litter												35	15			35		15			25				

1983.0311	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										5	5	5				5					5	5			
Agr.sca	5			5	5		5	5	5				5			5	5			5	5				
Bro.spp									5		5														
Cal.spp				5	5	5			5	5	5			5	5										
Car.spp	15	15	15	5	5	5	5	5	15	5	5	5	5	5	5	5	15	5	5	15	5	15	15	15	15
Dan.int												5	15			5	5				5			5	
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5
Ely.vil				5	5		5	5			5				5		5		5					5	
Fes.hal		5	5	55	35	35	45	45	45	15	5	25	25	15	15	25	35	35	15	5	5	5	15	5	15
Hes.spp			45	5														5	5	5		15	15	25	5
Koe.mac	5	5	5	5	15	5	5	5		5	5		5	5	5		5	5	5		5	5	5	5	5
Muh.rac									5	5	5														
Sch.pur	5									5		5				5									
Ach.mil	5	5			5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Aga.foe	5	5											5	5	5										
Ago.gla	5			5	5	5	5	5		5		5	5	5	5	5	5	5		5		5	5		5
All.spp			5	5	5																				
Ane.cyl	5													5											
Ane.mul																			5		5				
Ant.spp																									5
Ara.hir								5														5			
Art.cam					5	5																			
Art.lud	5	5	5	5	5	5	5													5					5
Ast.lax		5	5										5									5			
Cam.rot	5	5		5	5	5	5	5	5	5		5	5	5	5				5			5	5		5
Cer.arv			5												5			5	5	5		5	5	5	5

Com.pal		5	5	5	5		5	5	5	5	5	5	5	5	5	5	5		5	5	5	5			5
Eri.spp						5	5							5			5	5			5				5
Fra.vir	5										5			5											
Gal.bor	5	5		5	5	5		5		5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5
Gen.aff		5							5			5				5						5			
Geu.tri																	5	5	5	5		15		5	5
Hed.alp	5					5	5	5		5	5	5	5	5		5	5	5			5		5		
Heu.ric		5		5													5			5				5	5
Hie.spp						5	5		5		5		5		5		5		5		5				
Lat.och											5		5		5	5				5					
Lat.ven		5			5				5	5				5											
Lil.phi												5				5									
Mai.ste	5			5	5	5									5					5					
Muh.obl														5											
Ort.lut													5												
Oxy.cam																		5	5	5					
Pol.sen	5										5			5	5						5				
Pot.arg		5		5				5		5			5												
Sis.mon		5			5	5	5	5		5		5		5	5	5	5		5		5			5	
Sol.can										5					5										
Sol.mis	15	5	5	5	5	5		15	5	15		5	5	15	5	5	5	5	5	5	5	5		5	15
Son.spp															5										
Sym.lae	5	5		5					5	5	5	5		5	5	5	5				5				
Tar.off				5	5																				
Tha.ven	15	5		5		5	5	5	5	15	5	5	15	15	5	15				15					15
Vic.ame	5	5	5	5	15	5	5	5	5	5	5	5	5	5			5	5	5	5	5	5	5	5	5
Vio.adu				5		5	5	5	5				5		5		5			5	5		5		
Ziz.apt										5			5												
Ame.aln	25	15	15	15	5		5	5	5	5			5		5	5									
Arc.uva											75	5				5					15				
Lon.dio										5											5	5			
Pop.tre											5			25		5									
Ros.aci	15	15			5	5	5	5	5	5				5	5	5	5	5	5	5	5	5	15	15	5
She.can	25					5			5												5	5	5	5	15
Sym.occ		35	5	5		5				5															
litter	75	85	95	95	95	85	95	95	95	75	5	95	85	75	85	85	95	85	95	85	85	85	95	85	95
rock																					5			5	
bareground	5			5		5				5					5										

1983.0312	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																			5		5				
Agr.sca															5					5					
Bro.spp													5	5							5				
Cal.spp	5	5	5		5	5				5					5				5	5					5
Car.spp	5	5	5	5	5	5	5	5	5	5	5	5			5		5	5	5	5	5	5	5	5	15
Ely.spp	5	5	5	5	5	15	5	5	5	15	5		5	5	5				5	5	5		5	5	5
Ely.vil			5	5	5	5				5			5		5	5	5		5	5	5	5	5	5	5
Fes.hal												5	5		35				5	15	5				
Koe.mac	5						5			5					5	5				5					15
Muh.rac						5																			
Ory.spp								5	5			5	5	5			5	5	5			5			
Sch.pur																									5
Ach.mil		5	5		5					5			5	5	5			5		5					5
Aga.foe		5								5					5				5					5	5
Ago.gla										5					5					5					
Agr.str																					5	5			
Ane.can				5																					
Art.lud										5	5									5					5
Cam.rot			5												5										5
Cer.arv																				5					
Com.pal															5					5					
Eri.spp							5																		
Fra.vir								15			5		15	5	5	5	5	5	5		5	5	5	5	5
Gal.bor	5	5	5	5	5	5		5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5
Gen.aff							5								5										
Geu.tri																				5					
Hed.alp								5							5			5		5				5	
Heu.ric											5			5						5					
Hie.spp										5					5							5			
Lat.och						5			5		5	5	5		5	5			5	5					5

Lat.ven	15	5		5	5		5	5	5		15								5						
Lit.can															5										
Lys.cil			5					5					5					5	5						
Mai.can													5					5	5				5		
Mai.ste		5				5		5			5				5	5			5	5		5		5	5
Mon.fis		5	5	5		5	15	5	5						5										5
Ort.lut																									5
Oxy.cam			5																						
Pol.sen							5								5				5	5					
Pot.arg										5															
Pyr.asa																		5			5		5		
Sis.mon							5																		
Sol.can	15	15	5	5				15					5				5	5	5						
Sol.mis				5											5	5				5					5
Son.spp					5										5										
Sym.cil																		5				5			
Sym.lae			5	5					5	5			5	5	5	5	5	5	5		5		5	5	5
Tar.off																						5			
Tha.ven								5					5	5		5		5	5		5	5	5	5	5
Vic.ame	5	5	5		5	5	5	5		5	5		5		5				5				5	5	5
Vio.adu								5	5	5	5		5		5	5	5		5	5	5		5	5	5
Ziz.apt																						5			
Ame.aln	15	5	35	5	15	25	25	25	35	25	25	15	15	5	15	5	5	5	5	5			5	15	5
Arc.uva															5					25					
Bet.spp																	5				5				
Lon.dio												5		5	5	5			5						
Pop.tre			5	5		25		15		5	5				5		5			5					5
Pru.vir	25	5						15	15				5	5											
Ros.aci	15	5		15	5	5		5	5	5	5	5	15	15		5	5	25	5	5	5	5	25	25	5
Sal.beb																					5				
Sym.occ	15	5	5	25	25	5	15	5	5	5	5	25	5	5	5	5	5	5	5	5	5	5	5	5	15
Vac.cae																						5			
litter	85	55	35	65	65	95	85	5		65	5	5	5	5	75	5	5	5	5	85	5	5	5	5	65
bareground		45		25						5					15									5	15

1983.1171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										5					35									5	
Agr.sca			5	5			5			5			5	5		5	5	5		5	5		5	5	5
Bro.spp																	5		5		5	5			
Cal.spp														5	5				5	5					5
Car.spp	15	15	15			15	15	5	5	5	5	25	15	15	5	5	15	5	15	5	5	15	5	15	15
Dan.int			5																						
Ely.spp	5	5	5	15		15	15	5	5	15	5	5	5	15	5	5	5	5	15	5	5	15	5	5	5
Ely.vil														15				5		5		5			
Fes.bra				5														5	5				5	5	5
Fes.hal	15	15	5	5		5	25	5	15	5	15	35	5	15	5	15	5			5	15	15			5
Hes.spp																			5						
Koe.mac	5	5	5	5		5	5	5	5	15	5	15	5	15	15	5	15	5	5	15	15	15	5	5	5
Muh.rac																		5							
Ach.mil	5	5	5	5			5		5	5		5	5	5	5	5	5	5			5		5		
Aga.foe										5			5		5		5				5	15			
Ago.gla	5	5	5			5	5	5		5				5	5	5			5	5	5	5	5	5	5
And.sep				5		5			5	5		5													
Ane.cyl										5					5				5				5		
Ane.mul			5	5				5	5	5	5	5			5			5		5			5	5	5
Ant.spp			5	5			5			5			45			15	5	45	5	15	15		5	15	35
Art.cam																							5	5	
Ast.lax	5					5									5		5								
Cam.rot	5	5	5	5		5	5		5	5			5			5	5	5		5	5		5		5
Cer.arv			5	5															5						5
Com.pal	15	5	15	5		5	15	5	15		5	5	5	5			5	5			5	5	5		
Eri.spp	5		5	5		5	15		5	5	5	5	5	5	5		5		5	5		5	5		
Fra.vir						5					5	5		5		5			5	5	5		5	5	5
Gal.bor	15	5	15	5		15	15	15	15	5	5	5	5	25	5	5	25	5	15	5	15	15	5	5	5
Gen.ama		5				5	5														5				5
Hed.alp	5	5	5	5		15	5	5	5		5	5	5		5	5	5			5	5	5	5	5	5
Heu.ric																5									
Hie.spp	5		5			5				5	5				5				5	5	5			5	5
Lat.och				5		5		5	5	5	5			5						5	5	5		5	
Lil.phi										5						5									

Mai.ste														5	5					5					
Muh.obl															5										
Ort.lut			5				5		5			5	5	5	5		5	5	5	5	5		5	5	5
Oxy.cam						5	5				5													5	
Pol.sen		5		5		5	5	5	5		5		5		5	5	5		5	5		5	5	5	5
Pul.mul											5														
Sol.can						5																			
Sol.mis	5	5	5	15		15	5	5	15	5	15	5	15	5	5	5	5	5	5	5	5	15	5	5	5
Ste.lon				5						5			5	5	5										
Sym.lae	5	15		5				5	5	5	5	5	5	5			5	5			5			5	
Tha.ven	15	15				5	5		5	5		5		5	5		5			5	5	5	5	5	5
Vic.ame				5					5		5														
Vio.adu	5	5	5	5			5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5
Ziz.apt		5																							
Zyg.ele											5														
Ame.aln	5								25	5		5		15	5							5	5		
Arc.uva		45				25		95			35					45									
Pop.tre						5															5	5			
Ros.aci		5		5					5					5	5								5	5	5
litter	15	25	5	5		5	5	5	5	25	15	15	5	15	15	5	15	5	15	5	15	15	5	5	5
rock							5																		
bareground	75	5	85	95		75	85		95	65	15	85	55	35	75	55	75	45	85	65	55	85	85	75	65

1983.1172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		5		5			5																		
Bro.spp													5				5		5			5	5		
Cal.spp	5	5	5	5	5	5	5	5			5	5	5	5	5	5		5	5	5	5			5	5
Car.spp	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5		5	5	5	5	5	5	5	5
Ely.spp	5	5	5	5	5	5	5	5			15	5	5			5	5	5	5	5	5	5	5		5
Ely.vil	5		5	5	5	5	5	15		5	5	15	15	5	5	5	5	5	15	5	15	15	15	15	5
Fes.hal					5	5	5													5					5
Fes.sax							5																		
Hie.odo		5																							
Koe.mac	5	5	5	5		5	5	5		5	5	5	5	5	5	5			5	5					5
Ory.spp														5					5	5					
Sch.pur			5																						
Ach.mil	5	5		5	5	5	5	5		5	5	5	5	5	5	5			5	5	5	5			5
Aga.foe	5					5				5			5												
Ago.gla		5					5						5							5					
And.sep	5		5																						
Ane.cyl	5						5																		
Ane.mul		5																							
Ant.spp		5					5					5													
Cam.rot	5	5		5	5	5	5				5			5		5					5				
Cer.arv											5														
Coe.vir														5											
Com.pal				5	5					5				5	5					5					5
Epi.ang										5				5			5					5	5		
Eri.spp	5	5	5																	5					
Fra.vir	5		5	5	5	5	5	15		5	15	15	15	5	5	5	15	5	5	5	5	15	5	5	5
Gal.bor	5	5	5	5	15	5	5	15		5	5	5	5	5	15	15	15	5	5	15	15	25	15	15	25
Gen.aff				5	5						5					5		5	5			5			5
Hed.alp		5	5	5	5		5	5		5	5	5	5	5	5	5			5	5			5		5
Heu.ric																				5					
Hie.spp				5	5		5	5						5								5			5
Lat.och	5				5	5	5	5			5		5	5	5	5	5	5	5	5	15	5	5	5	
Lit.can				5			5																		
Mai.can					5			5						5	5									5	
Mai.ste						5														5					
Oxy.cam							5			5	5									5					
Pol.sen	5	5	5	5	5	5	5	5			5	5								5					5
Pot.arg		5																							
Sis.mon							5				5														
Sol.can	5		15	5		15				5			5	5		15	5	15	5			5	5		
Sol.mis	15	15	5	5	5	5	15	5			15				5	5	5			5		5			5
Sol.rig										5				5											
Ste.lon	5	5									5														
Sym.cil																	15		5				5		
Sym.lae	5	5	5	5	5					5	5	5	5	5	5	5		5	5	5		5		5	5
Tha.ven			5	5	5	5	5			5						5	5	5	5	5	5			5	5

Vic.ame	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5		5	5	5	15	5	5
Vio.adu	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5		5	5	5	5	5	5	5
Ziz.apt							5																		
Zyg.ele			5			5									5										
Ame.aln	5	5			5					5			5					5					5	5	
Arc.uva			15	55	55	25								5	5					25	5				
Pop.tre			5	5	5	5	15	5			5	15	5	15	25	5	5	5	5	5	35	15	25	15	5
Ros.aci		5				5		5		15	5	5	15	15	15	5	25	25	5	5	15	15	25	5	
Sal.beb																			5						
Sym.occ	5	5	5			5	15				5		25				15	15	15		15		15	15	15
Vac.cae										5								5		5					
litter	5	5	5	5	5	5	15	15		5	15	35	55	15	25	45	15	5	65	15	15	35	15	15	15
bareground	95	95	75	55	45	75	75	75		75	35			55	35		5			35					55

1983.1181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																							15	15	
Agr.sca	5	5	5				5	5	15	5			5		5				5				5		
Bro.spp								5						5											
Cal.spp				5	5	5																			
Car.spp	15	5	5	25	5	15	15	5	5	5	5	5	25	5	5	15	15	15	15	5	5	15	5	15	25
Dan.int		5																					5	5	
Ely.spp	15	5	15		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ely.vil			5	5	5	5	5		5	5	5	5	5		5	5				5		5			
Fes.hal	35	15	35	35	15	25	25	15	15	5	5	5	5	5	5	15	5	5	5	5	5	5	5	15	15
Fes.sax					5				5	5					5									5	
Hes.spp		5	5		5						15	25	15	5	5		25	15	15		35	35	5		
Koe.mac	35	15	25	15	5	25	15	15	15	5	15	15	15	15	15	15	15	15	15	5	15	5	5	5	15
Poa.spp			5																						
Ach.mil	5			5		5				5		5	5		5	5		5	5	5				5	5
Ago.gla	5	5	5		5		5	5	5	5	5	5	5	5	5	5			5			5	5		
And.sep																			5		5				5
Ane.cyl																			5						
Ane.mul	5		5	5	5	5	5	5			5		5	5	5		5		5	5	5	5	5	5	
Ant.spp	15	65	5	5	5		5	5				5			5			5					5	5	
Art.cam																				5					
Art.lud												5					5				5				
Ast.lax										5										55					
Cam.rot		5	5	5	5	5				5		5	5			5	5		5	5	5	5	5	5	5
Cer.arv	5		5		5	5		5			5	5	5			5	5			5	5		5		5
Com.pal								5		5			5	15	5	5	5		15	5		5	5	5	5
Epi.ang						5																			
Eri.spp	5		5		5		5	5			5		5				5		5			5		5	5
Gai.ari											5	5					5		5						
Gal.bor	5	15	15	5	5	5	15	15	5	15	5	5	5	5	15	5	5	5	15	5		15		5	5
Gen.ama							5																		
Geu.tri												5				5					5	5	5		
Hed.alp	5	5	5	5	5		5	5	5		5			5	5		5		5					5	
Heu.ric		5	5	5					5			5									5			5	
Hie.spp	5	5	5		5		5		5			5	5				5		5			5		5	
Lat.och	5	5	5	5														5	5						
Lil.phi																								5	
Mai.ste	5																		5						
Ort.lut	5	5	5	5	5			5					5	5	5			5	5		5			5	
Oxy.cam		5			5		15			5					5		5	5	5				5		
Pol.sen	5	5	5	5		5	5	5		5				5					5				5	5	
Pot.arg	5							5																	
Pot.pen																				5					5
Pul.mul		5																						5	
Sis.mon										5	5					5							5		
Sol.mis	15	5	15	15	5	5	5	15	5	15	5	5	5	5	15	15	5	15	5	5	5		5	15	5
Ste.lon	5			5				5																	
Sym.lae		5	5			5										5			5				5		
Tha.ven	5	5	5			5		15			5		5	5	5	5			5				5	5	
Vic.ame		5			5	5				5	5	5				5	5	5			5	5	5		5
Vio.adu	5	5	5	5	5	5	5	5	5	5			5	5	5	5			5			5	5	5	
Zyg.ele		5																							
Ame.aln			5									5													
Arc.uva											15						25						55		
Pop.tre																						5			
Ros.aci				5						5	5					5	5	5		5	5				

Vac.cae			5	5	15					5												5			5
litter	25	15	65	15	5	65	15	25	5	5	15	25	25	15	5	25	15	5	25	5	25	25	15	15	15
bareground	65	25	25	65	85	25	55	75	85	75	65	45	65	85	85	75	55	85	45	75	45	45	15	65	55

1983.1182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric					5					5															
Agr.sca		5	5			5			5		5	5				5	5	5		5		5	5	5	
Cal.spp		5							5			5	5	5	5	5				5		5			
Car.spp	5	5	5	5	15	5	5	5	5	5	5		5	5		5	5	5	5	5	5	5	5	5	
Dan.int					5																				
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Ely.vil			5			5						5		5		5	5		5	5		5	5		
Fes.hal	25	5	5	5	5	5	5	5	15	5	5	5	5	15	5	15	5	15	15	15	15	15	5	5	
Fes.sax			5								5				5				5		5			5	
Koe.mac	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	15	5	5	5	5	
Ory.spp												5	5												
Sch.pur															5										
Ach.mil		5	5				5		5	5	5	5	5	5	5	5	5		5	5			5	5	
Aga.foe										5					5										
Ago.gla	5	5			5	5	5	5	5		5						5	5			5		5	5	
And.sep			5																						
Ane.cyl							5	5													5	5	5	5	
Ane.mul								5	5		5						5	5	5	5	5		5	5	
Ant.spp		5	5	5	15						15						5				5				
Art.cam																					5	5			
Cam.rot	5	5	5			5		5			5		5	5		5	5			5	5	5	5	5	
Cer.arv	5	5	5													5	5				5		5	5	
Coe.vir																	5								
Com.pal	5	5	15	5	5	5	5	15	5	5	5	5	5	5			5	5	5	5		5	5	5	
Eri.spp	5	5										5				5	5	5	5	5					
Fra.vir												5	5	5	5		5								
Gai.ari	5																								
Gal.bor	5	5	5	15	5	5	5	15	15	5	5	5	5	15	5	5	5	5	15	15	5	5	5	5	
Gen.aff									5					5			5	5				5			
Hed.alp	5		5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5		5	5	5	
Heu.ric							5				5				5	5									
Hie.spp					5	5		5			5	5		5	5	5	5	5	5	5	5	5	5		
Lat.och	5			5	5		5		5			5	5	5	5		5	5				5			
Lit.can									5					5		5									
Ort.lut		5				5															5				
Oxy.cam			5	5	5		5	5		5								5	5	5		5		5	
Pol.sen	5	5	5	5	5	5	5	5		5	5	5	5	5	5		5	5	5	5	5	5	5	5	
Pot.arg										5															
Pul.mul	5						5		5					5											
Sis.mon	5			5						5			5	5			5								
Sol.mis	5	15	15	5	5	15	5	5	5	5	5	5	5	15	5	15	15	15	5	5	5	5	5	5	
Ste.lon			5																						
Sym.lae		5	5	5			5	5	5	5	5	5	5	5	5	5	5		5		5				
Tha.ven	5	5		5	5		15	5	5	5	15	5	5	5	5	5		5	15				5		
Vic.ame	5	5		5	5	5			5	5		5	5	5	5	5	5			5			5		
Vio.adu	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	
Ziz.apt								5					5				5		5						
Zyg.ele										5								5							
Ame.aln																			5			5	5		
Arc.uva				65	25		75	25	25	15	15	65	35	5	85				5	5				5	
Pin.ban																		5							
Pop.tre		5	5		5	5	5	5				5	5			5	5	15		5			5	5	
Ros.aci	5		5	15	5	5	5	5			5	5	5				5	5	5			5	5	5	
Sym.occ	5			5				5																	
litter	25	15	15	5	5	15	5	5	25	5	15	5	5	45	5	25	35	35	15	25	15	15	5	5	
rock																		5			5	5			
bareground	75	75	75	25	45	85	5	65	15	65	55		5	45		75	65	65	75	65	75	75	85	75	

1983.1271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric			5											15	15										
Agr.sca	5	5	5	5	15		5	5	5	5	5	5			5	5	5	5	5	5		5	5	5	5
Cal.spp					5					15				15			5		5	5			5	5	
Car.spp	15		15	15	15	15	15	15	15	25	15	15	15		5	5	15	15	15	15	5	15	25	25	15

Dan.int	35																					5		
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5
Ely.vil	5	5	5	5	5	5	5	5	5	5															5
Fes.hal	15	35	55	55	35	25	15	25	5	25	45	55	35	5	55	55	55	35	55	15	45	15	5	5	5
Fes.sax							5																		
Hes.spp											5	5			5	5									
Koe.mac	5	15	15	5	5	5	5	15	5	5	5	5	5		5	5	5	5	15		5	5	5	5	5
Poa.spp						5																			
Sch.pur													5												
Ach.mil			5	5		5		5	5		5		5	5	5		5	5	5	5		5	5	5	5
Aga.foe				5		5								5			5								
Ago.gla	5	5	5	5	5		5			5	5							5	5					5	
All.spp																					5				
And.sep	5							5	5														5		
Ane.cyl																		5							
Ane.mul	5	5			5					5		5			5	5		5	5		5	5	5		5
Ant.spp				5														5	5		5				
Ara.hir																				5					
Art.fri					5																				
Art.lud		5							5		5	5			5	5				5					
Cam.rot	5	5	5		5	5		5	5	5	5	5	5	5	5	5	5	5	5		5	5		5	
Cer.arv	5				5		5				5	5			5	5	5		5		5	5	5		
Com.pal	5	5	5	5		5	5	5			5	5	5				5	15			5	5	5	5	
Eri.spp		5		5		5	5	5	5						5						5				
Fra.vir	5					5	5							5				5		5					
Gai.ari												5							5						
Gal.bor	15	15	15	15	5	15	15	5	15	5	15	5	15	15	5	15	15	15	5	5	25	15	15	5	15
Gen.aff																			5						
Hed.alp	5		5	5			5			5	5			5	5		5							5	
Heu.ric													5												
Hie.spp		5	5		5		5			5	5				5	5	5				5				
Lat.och	5	5	5		5	5			5	5				5			5	5	5	5				5	
Lit.can													5								5				
Mai.ste	5	5	5		5	5			5	5				5			5	5	5	5					
Ort.lut	5								5														5		5
Oxy.cam							5														5				5
Pot.arg										5								5							
Pot.pen											5	5													
Pul.mul				5																			5		
Sol.mis	5	5	5	5	5		5	5	15	5	5	5	5	5	5	5	5	15	5		5	15	5	5	15
Ste.lon	5	5	5				5			5					5			5							
Sym.lae	5	5	5	5		5	5			5	5			5			5	5	5	5					
Tha.ven	15	5	5	5		5	15	5	15	15	5		5	5			5	5	5	5			5		
Vic.ame		5	5	5	5		5	5		5	5	5	5	5	5	5		5			5	5	5	5	
Vio.adu	5	5	5	5	5		5	5		5	5		5	5	5		5	5	5			5	5	5	
Zyg.ele	5																								
Ame.aln	5		15			5	5	5					45	15										5	
Ros.aci		5	5	5					5		5			5	5	5	5	5	5		5	5			
Sym.occ				5	45	15	5	5	5	15		5	5	5	5	5	5	5	5	55			5	35	5
litter	85	55	75	75	75	95	85	85	75	85	65	85	75	75	85	85	75	65	75	65	65	55	65	75	5
rock												5				5						5			
bareground	5	45	5	5	5			5	25	5	25	5	5	5			25		5	5	15	25	5	5	55

1983.1272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric						5						5									15				
Agr.sca	5	5	5		5				5	5	5	5	5		5	5	5		5		5	5		5	5
Bro.spp				5																					
Cal.spp	5		5	5	5	5	5	5				5	5	5			5	5	5	5				5	5
Car.spp	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Dan.int															5										
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5
Ely.vil			5	15										5		5		25	15	5				15	15
Fes.hal	15	5	15	5		5	5	5	15		5	5	5	5	5	5	5			5	5	5	15	5	5
Fes.sax												5					5				5				
Hes.spp	15	25		5						5	5	5					15				5	25	25		5
Hie.odo																									5
Koe.mac	15	5	5	5	5	5	5	5			15	5			5	5	5	5	5	5	5	15	15	5	5
Poa.spp																5									
Sch.pur				5			5	5						5		5									
Ach.mil	5	5	5	5	5	5		5	5		5	5			5	5	5	5	5		5			5	

Aga.foe		5				5																5			
Ago.gla					5				5			5			5				5	5	5				5
And.sep	5														5		5				5				
Ane.cyl	5					5									5		5								
Ane.mul												5			5										
Ant.spp															5										
Art.lud																						5		5	
Ast.lax					5										5							5			
Cam.rot	5	5		5	5			5	5			5		5	5		5	5		5	5	5	5	5	5
Cer.arv	5	5			5						5						5						5	5	
Com.pal		5		5			5	5	5	5		5	5	5	5		5	5	5		5	5	5		
Epi.ang						5										5									
Eri.spp										5											5	5	5		
Fra.vir			5			5	5		5				5	5					5	5					
Gai.ari					5																				
Gal.bor	15	15	5	5	15	5	5	15	15	5	15	5	5	5	5	5	15	5	5	5	15	5	5	5	15
Gen.aff				5										5		5									
Hed.alp				5		5		5		5		5	5							5				5	
Heu.ric												5		5					5						
Hie.spp														5	5		5		5						
Lat.och			5	5		5	5	5	5	5	5		5	5		5		5		5				5	
Lia.lig																			5						
Lit.can			5					5	5				5												
Mai.ste							5				5	5	5											5	
Ort.lut															5					5					
Oxy.cam												5			5				5			5	5		5
Pol.sen			5											5	5				5	5			5	5	5
Pot.arg																			5						
Pot.pen																						5	5		
Sis.mon						5															5				
Sol.can							15									35									
Sol.mis	5	5	5		5	5		5	5		5	5	5	5	15		5	5	5	5	5	5		5	5
Ste.lon						5			5															5	
Sym.lae	5		5	5	5	5	5	5	5				15	5		15		5	5			5		5	
Tha.ven	5		5	5		5			5	5		5	5	5	5	5	5	5		5	5		5	5	5
Vic.ame	5	5		5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5
Vio.adu	5	5	5	5	5	5	5	5	5		5	5			5	5		5	5	5	5	5		5	5
Ziz.apt							5						5	5											
Ame.aln						5	35	15																	15
Arc.uva			45					5	35	65			55	55											
Pop.tre	5		5	5			5	5	5			5	5	15	5	5			5	5					
Ros.aci	5	5		5	5	15	5	5		5	5	5	5	5	5		5		5	5	5	5	5	5	
Sym.occ	15	5	5	5	5	5	5	15	5	5	15						5	5			5	5			
litter	85	45	35	75	15	25	25	35	65	5	15	35	15	5	15	35	35	75	55	45	35	75	75	65	85
rock		5															5					5			
bareground	5	35	5	5	55	35		5			65	45	5		65	45	45	15	25	45	35	5	15	15	

1983.1281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																									5
Agr.sca	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15			5	5	5	5	5	5	5	5
Cal.spp	5	5	15	5									5	5			5	5			5	5		5	
Car.spp	15	15	15	15	15	15	15	15	15	15	15	5	15	15	5	15	5	15	5	5	5	5	5	5	5
Ely.spp	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5
Ely.vil		5	5		15	5	5																		
Fes.hal		5	5	5	5	5	15			45	55	35	15	15	35		15	5	15	25	35	15	5	5	45
Fes.sax	5																						5	5	
Hes.spp								35		5			5		5	55	45	15	15	5	5				5
Koe.mac	5	5	15	35	5	25	5	15	15	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5
Poa.spp							5		5																
Sch.pur																						5			
Ach.mil	5	5	5	5	5	5	5		5	5	5	5	5	5	5		5			5		5	5	5	5
Ago.gla				5	5						5	5	5	5				5				5	5	5	
And.sep			5					5										5	5						
Ane.cyl																5				5					
Ane.mul			5	5	5				5	5			5					5		5	5	5		5	5
Ara.hir													5	5					5						
Art.cam																								5	5
Art.lud								5	5	5	5						5								
Cam.rot		5	5	5	5	5	5	5			5	5		5	5	5	5	5	5	5	5	5	5	5	
Cer.arv	5		5	5		5	5		5	5	5	5	5	5	5	5	5	5			5	5		5	5

Com.pal										5					5								5	5	5
Eri.spp	5		5	5		5	5	5	5		5	5	5	5	5		5	5					5		
Fra.vir		5	5						5			5													
Gal.bor	15	5	15	5	25	5	15	15	5	5	5	5	5	5	5	5	5	5	5	5	5	15	15	15	5
Hed.alp				5													5						5	5	
Heu.ric				5						5					5								5		5
Hie.spp																		5	5						
Lat.och		5	5																						
Ort.lut	5	5	5	5	5		5	5	5	5			5	5				5			5	5	5		
Oxy.cam			5					5	15	5				5		5					5				
Pol.sen		5						5				5		5			5	5	5	5	5	5	5	5	5
Pul.mul			5	5																					
Sis.mon	5						5																		
Sol.mis	15	15	5	15	5	5	15	5	15	5	5	5	5	15	5			5	5	5	5	15	15	15	5
Sol.rig			5		5			5			5		5	5						5					
Ste.lon	5	5	5	5			5																5		
Sym.lae	5		5		5			5	5	5			5										5	5	
Tha.ven	5	5	15	5	5	5	5	5	5	5	15	5		5	5			5	5	5	5	5	5	5	5
Vic.ame	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5		5
Vio.adu	5	5	5	5	5	5	5		5	5			5	5	5		5	5	5	5	5	5	5	5	5
Ame.aln						15			5							5									15
Arc.uva															5						5				
Pop.tre																						15	5	5	15
Ros.aci	5		5		5	5	5				5		5	5	5		5	5	5		5	5			
Sym.occ	5	15				5	5	5		5	5	15	5			15					5				
litter	25	65	35	55	65	65	45	65	25	75	65	75	55	45	55	75	75	65	55	75	65	55	25	5	75
rock					25								5												
bareground	45	5	35	45	5	5	15	15	15	15	15		5	15	25	5	5	25	15	5	15	15	55	65	5

1983.1282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric						5																			
Agr.sca	5	5		5	5																	5	5		
Bro.spp						5	5			5	5	5													
Cal.spp	5	5	25			5	5	5			5	5		5	5		5		5					5	5
Car.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5
Dan.int																		5							
Ely.spp	5	5	15	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15
Ely.vil			5	5	5		5	5	25	15	5	5	5	5	25	5	15	5	5		15	5	15	5	5
Fes.hal	15	15				5					5				5	5		5	5	5	5	5	5	5	
Fes.sax					5																5	5			
Hes.spp	5			5																					
Koe.mac	5	5	5	5	5	5		5			5	5	5	5		5	5	5	5	5	5	5	5	5	5
Poa.spp			5																						
Sch.pur						5	5													5					
Ach.mil	5			5	5	5	5		5		5	5	5		5	5	5	5	5	5	5		5	5	
Aga.foe						5															5				
Ago.gla		5							5																
And.sep														5											
Ane.cyl					5												5					5			
Ane.mul												5	5			5			5		5	5	5		
Ant.spp					5																				
Ara.hir																							5		
Cam.rot	5			5	5	5	5	5		5	5	5		5		5	5		5		5	5	5		
Cer.arv		5						5											5					5	
Com.pal	5		5	5		5			5		5										5			5	5
Epi.ang									5																
Eri.spp	5																						5		
Fra.vir			5	5		5	5	5	5		5	5	5	5	5		5		5	5	5	5	5	5	
Gal.bor	15	5	15	5	5	5	15	15	5	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15
Gen.aff									5			5					5			5				5	
Hed.alp				5	5	5	5				5	5			5			5			5	5	5	5	
Heu.ric				5			5		5			5													
Hie.spp	5	5						5					5			5						5		5	
Lat.och		5	5	5			5	5	5	5	5			5	5		5	5	5			5			
Lil.phi												5													
Lit.can	5				5		5	5																	
Mai.ste						5	5	5								5		5	5	5		5			5
Ort.lut		5			5																				
Oxy.cam	5	5			5							5				5				5	5	5			
Pol.sen	5	5		5	5		5	5	5	5	5	5		5	5		5	5	5	5	5	5	5	5	5

Pot.arg						5		5																
Sis.mon					5																			
Sol.can										5		5	5	5	5									
Sol.mis	5	5	15	5	15	5		5	5		5	5	5			5	5	5	5	5	5	5	15	15	5
Ste.lon											5		5				5						5	5	
Sym.lae		5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5			5			5		5
Tha.ven	5	5		5	5	15	5	5	5	5	5	5	5	5	5	5		5	5	5		5	5	5	5
Vic.ame		5		5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5		5	5	5	5
Vio.adu	5	5	5		5	5	5	5	5	5	5		5	5	5	5	5	5	5		5	5	5	5	5
Ziz.apt												5													
Ame.aln			5		5	5	15					5		5	5								5	5	15
Arc.uva				85		15		5	5		5	5								55					
Pop.tre		5		5	5	5	5	5	5		5		5	5	15	5	5	5	5					5	
Ros.aci	5	5	15			5	5	15	5	5		5	5	5	5	5	5	5	15	5		5		5	
Sym.occ	5								5			5				5	15	5	5	5	5	5	5	5	5
litter	35	65	55	5	25	45	55	5	65	15	65	35	5	5	55	25	25	35	15	5	15	45	45	45	65
rock																	5	5							5
bareground	55	35	45		25	25	55	75	5	75	15	15	65	55		45	55	55			65	45	25	25	

1983.2112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric		5							5		15	15	25			35	35			15			15		15
Agr.sca	5	5	5																						
Bro.spp	5		5	15		5						5	5		5				5		5	15	5	5	
Cal.spp			25	75			5						5	5			5						5	15	5
Car.spp	15	5	15	35	15	5	5	5	45	15	15	15	55	35	15	15	25	65	35	45	25	25	45	25	15
Ely.spp				15	15		5	75	35	45	5	15	5	15	25	15		15	15	25	15	15	15	25	25
Ely.vil					15					5		5	5		5		5								
Fes.hal		5	5		15	5	5	5		5	5	5	25	5	5	5	15			5		5			5
Hel.hoo																									5
Hes.spp										5										5	45	35	15		5
Koe.mac					15					35				35	25	35	25	15	25	25	15	5	15	15	35
Muh.rac															5										
Poa.spp		5	5		5					5					5			5	5				5	15	
Sch.pur	5	5	15		5	15	5	15			15			5		15	15		5			5			
Ach.mil				5	5	5			5	5		5	5	5	5			5	5	5	5		5	5	5
Aga.foe			5	5					5																
And.sep																								5	
Cam.rot					5					5	5				5		5			5			5		
Cer.arv																					5				
Com.pal																				5					5
Epi.ang	5	5	5	5	5	15	5	5	5	5	5	5	5	5		5	5		5			5	5		5
Eri.spp								5	5					5									5		
Fra.vir	5	5	15			5	5	5			15	15		5					5						
Gal.bor	5	15	5	15	5	5	15	15		15	15	5	15	15	35	25	15	15	15	15	15	15	15	25	25
Gen.aff						5										5				5					
Hed.alp		5	5			5												5							
Heu.ric							5																		
Lat.och	15	15	5	15	5	5	5	15	5	15	5	5	15	5		5	15	15		5	5	5	5	5	5
Lia.lig									5							5									
Mai.ste	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5		15	15			
Oxy.cam																									15
Pot.arg					5											5									
Pre.rac																				5					
Sis.mon		5								5					5			5	5	5	5				5
Sol.can				5	15	5					5	5		35			5	15	15					5	
Sol.mis									5	5				5	15				5	5	5	5	5	5	5
Sol.spa							5		5				5												
Ste.lon				5																					
Sym.lae				15	5		5	15			5	5		5	5			5	15	5	5	5	5	15	15
Tar.off															5										5
Tha.ven		5	5	5	5	5		5	5	5	5	15	5	5		5	5		5	5	5	15	5	5	5
Vic.ame			15		5	5	5		5		5	5		5	15	5		5	5			5	5	15	5
Vio.adu	5	5	5	5	5		5	5	5	5			5	5	5		5	5	5	5	5	5		5	
Ziz.apt																					5				
Cor.cor							5																		
Pop.tre	25	15				5	5	5	5		15	5	5	5		5	5	5		15	15	15	5		5
Ros.aci	5	5				15	15	25	25		35	35	35	15	15	15	15			15	15	25	25	15	25
litter	85	65	75	35	85	85	65	75	85	85	85	75	85	85	65	85	75	85	85	65	95	55	85	45	85
bareground				15	5		5								25		15	5		25		25		35	5

1983.2171	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ach.ric	5															5							5		
Agr.sca		5	5	5			5	5			5			5	5	5	5	5		5	5	5	5	5	
Bro.spp					5																				
Cal.spp	5	5	5			5	5	5	5	5		5					5	5	5	5					
Car.spp	15	5	15	15	15	15	5	5	5	5	15	15	5	15	5	5	5	5	15	15	15	15	15	5	5
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5
Ely.vil	5	5	5	5	5	5	5	5	5	5			5	5	5		5	5	5		5	5			5
Fes.hal	35	15	35	25	45	25	15	5	25	5	15	35	45	25	15	5	5	15	5	15	25	15	25	15	15
Fes.sax													5		5										
Hie.odo		5					5												5						
Koe.mac	5	5	5	5	15	5	15	15	5	5	5	5	15	15	5	5	5	15	25	35	35	15	25	5	15
Muh.rac													5												5
Poa.spp			5																						
Ach.mil		5		5	5	5		5	5	5		5				5	5	5	5	5	5	5	5	5	5
Aga.foe		5					5						5												
Ago.gla	5	5		5	5	5	5	5	15	5	5	5			5	5		5		5					5
Ane.cyl			5	5	5				5		5	5				5			5		5			5	5
Ane.mul	5	5				5	5								5		5		5		5		5	5	
Ant.spp			5						5						5		5								
Art.lud																					5	5			
Cam.rot	5	5	5		5			5		5			5	5	5	5		5	5	5	5	5	5	5	5
Cer.arv				5						5															
Com.pal																							5	5	15
Eri.spp		5	5	5		5	5		5	5	5	5	5	5	5		5	5		5	5	5	5	5	
Fra.vir	5		5		5			15		5					5					5				5	5
Gai.ari										5															
Gal.bor	15	15	5	15	5	5	15	15	5	5		5	5	5	5	5	15	15	5	5	5	5	15	5	15
Gen.aff																									5
Geu.tri																	5								
Hed.alp					5			5			5	5	5	5	5			5		5				5	
Heu.ric			5	5	5					5			5	5	5				5					5	5
Hie.spp			5	5	5			5	5		5				5					5			5	5	5
Lat.och		5	5	5	5	5	5		5	5	5	5	5						5			5	5	5	5
Lil.phi		5		5	5		5															5		5	5
Lit.can		5			5				5		5														
Mai.ste	5				5		5			5	5				5		5								5
Ort.lut			5	5																					
Oxy.cam																									5
Pol.sen	5		5	5	5			5		5					5										
Pot.arg			5	5						5									5						5
Pul.mul																	5							5	
Sis.mon	5	5		5	5		5	5	5		5	5	5			5			5	5	5	5		5	5
Sol.mis	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	15	15	15		5	5	5	5	15	
Ste.lon		5						5								5								5	
Sym.lae	5	5	5	5			5	5	5	5	5	5		5		5	5	5	5	5			5		5
Tha.ven	5	5	15	5	5		5	5	5	15	5		5	5	5	5		5	15	5	5	5	5	15	15
Vic.ame	5	5					5	5				5		5		5	5	5		5	5				
Vio.adu	5	5	5	5		5		5	5	5	5	5	5	5	5	5	5	5	5	5		5		5	5
Ame.aln		5			5		15			5		5							5			5			
Pop.tre															5					5					5
Ros.aci		15				5			5		5	5	5	5	5	5	5		5		5			5	
Sym.occ			15	5	15	15		5	15	5		15	5	15	5	5	15	5	5	5	5	45	5		5
litter	15	5	25	25	15	5	25	5	15	5	5	15	5	5	5	5	15	15	25	25	75	15	25	15	15
bareground	75	85	65	65	75	85	65	85	75	75	75	65	85	75	75	95	75	75	75	55	5	65	55	75	75

1983.2172	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ach.ric																25		5							
Agr.sca	5											5				5	5	5			5				5
Bro.spp			5	5	5					5	5			5	5										
Cal.spp	5	5		5		5	5						5	5	5		5	5	5	5	5	5			
Car.spp	5	5	5	5	5	15	5	5	5	5	5	5	25	5	15	15	5	5	5	5	15	5	5	5	5
Ely.spp	15	5			5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ely.vil		5	15	5	15	5	5	25	15	15	5	5	5	15	15	5	5		15	5	5	5	5	5	5
Fes.hal							5				5	5		5		5	5	5	5			5			5
Hes.spp																						5			
Hie.odo											5														
Koe.mac	5	15				5	5				5	5	5			5	5	5	5	5	5	15	15	5	5
Muh.rac																									5
Ory.spp							5			5				5											

Poa.spp																		5	5	5					
Sch.pur	5								5				5		5					5					
Ach.mil	5	5	5		5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Aga.foe		5																							5
Ago.gla							5									5									
And.sep																	5								
Ane.cyl						5					5	5		5										5	
Ane.mul												5				5					5				
Ant.spp	15					5	5														5				5
Art.lud																									5
Cam.rot	5	5	5				5	5			5		5			5	5		5			5	5	5	5
Cer.arv																								5	5
Cor.can					5																				
Epi.ang					5					5															
Eri.spp		5				5										15		5	5		5	5	5		
Fra.vir	5	15	5	15	15	5	5	5	5	15	5	15	5	15	5	5		15	15	5	5	5	5		
Gal.bor	5	15	15	15	5	5	5	5	5	5	5	5	15	15	5	5	15		15	15	5	5	5	5	5
Gen.aff	5					5	5				5	5	5	5				5		5					
Hed.alp	5	5	5	5	5	5			5		5	5	5	5						5				5	
Heu.ric	5						5				5				5		5						5		5
Hie.spp						5	5			5	5	5										5			
Lat.och	5	5	5	5	5	5	5	5	5	5			5	5	5	5	5	5	5	5		5			
Lil.phi						5																			
Lit.can																5									
Mai.can			5	5	5			15	5	5															
Mai.ste																			5						
Ort.lut																								5	5
Oxy.cam																5					5			5	5
Pol.sen	5					5	5				5	5	5			5	5	5			5				
Pot.arg	5			5										5					5						
Pot.pen																								5	
Pyr.asa			5	15	35					5															
Sis.mon						5															5	5		5	
Sol.can				5					5	15				25	5					5					
Sol.mis	15					15	5				15	5		5		5	15	5	5	5	15		5	15	5
Sol.rig												5													
Son.spp																				5					
Ste.lon																									5
Sym.cil				5	25				5	15					25										
Sym.lae	5	5	5			5	5	5	5	5	5		5	5	15	5	5	5	5	5	5	5	5		5
Tha.ven	15					5		5			5		15	5	5	5	5	5	15	5	5	5	5	5	
Vic.ame	5	5	5	5	15	5	5	5	5	5		5	5		5	5		5		5	5				
Vio.adu	5	5		5	5	5	5	5			5	5	5	5		5	5	5	5	5	5	5		5	
Ziz.apt													5												
Ame.aln	5							5	5		5		5		5					5					
Lon.dio				5																					
Pop.tre	5	5	5	15	15	5	5		5	15	15	15	5	15	5			5	5	5					
Ros.aci		25	5	25	5	5	5	25	5	5	5	5		15	15		15	5	5	5	5	5	5		
Rub.spp								5		5															
Rub.pub			5	15																					
Sal.beb			5	5	35																				
Sym.occ	5	5	5	5	5	5		5								5	5	15	5		25	5	5	5	5
litter	5	25	25	65	25	25	15	15	35	55	25	15	15	35	15	5	5	15	25	35	15	15	15	5	15
rock																	5			5				15	
bareground	85	5	5			75	35	25	5		25	15	25	5	25	85	85	75	75	65	75	85	95	85	85

1983.2181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										5									25	5			15		
Agr.sca				5	5																	5	5		
Cal.spp						5																		5	
Car.spp	5	5	5	5	5	5	5	5	5	15	15	5	5	5	15	5	5	5	5	5	5	5	5	5	5
Dan.int				15	15												5				25	25			
Ely.spp	5	5	5	5	5	5	5	5	5	5	5		15	5	5	5	5	5		5	5	5	5	5	5
Ely.vil	5	5	5	5	5	15	5	15	15	5	5	5	5	5	5	5	5		5	5		5			5
Fes.hal	15	15	15	15	15	5	5	5	5	25	5	5	5	15	25	25	15	5	5	35	15	5	15	5	15
Fes.sax																							5		
Hes.spp																35		15			25	15	5		
Hie.odo											5										5	5			
Koe.mac	5	5	5	15	5	5	5	5	15	5	5	5	5	5	15	15	5	5	15	5	5	5	5	5	5
Muh.spp																		5							

Poa.spp	5			5		5					5	5	5												
Ach.mil	5	5	5	5	5		5	5	5		5	5	5	5	5	5	5	5				5			5
Aga.foe					5																				
Ago.gla		5		5					5	5		5			5	5			5	5				5	5
And.sep																		5							
Ane.mul			5	5	5				5			5						5				5	5	5	5
Ant.spp																							15		5
Art.fri											5														
Art.lud		5	5													5		5			5			5	
Ast.lax												5													
Cam.rot			5	5	5	5	5	5		5	5	5		5	5	5	5					5	5	5	5
Cer.arv			5	5	5		5		5										5				5		
Com.pal			5	5	5			5	5		5					5					5				
Eri.spp	5	5		5			5	5	5	5		5			5			5	5	5	5	5		5	5
Gal.bor	15	15	5	5	5	15	5	5	15	15	5	5	15	5	15	5	5	15	5		15	5	5	5	
Gen.aff			5					5	5															5	
Geu.tri			5				5					5					5						5		
Hed.alp		5	5	5	5		5	5		5		5		5	5					5				5	5
Hie.spp				5																					
Lat.och	5			5	5			5		5				5										5	
Mai.ste				5	5				5																5
Ort.lut																	5	5					5	5	5
Oxy.cam	5	5	5		5	5	15	15				5		5			5		5			5	5		5
Pol.sen			5	5					5							5			5					5	
Sis.mon		5	5		5		5		5		5			5	5	5	5	5	5				5	5	
Sol.mis	5	5	15	15	15		5	15	15	15	5	15	5	5	5	5	15	5	5	15		5	5	15	15
Ste.lon						5			5						5		5								
Sym.lae		5		5				5	5																
Tha.ven		15	5		5			5	5	5	5			15	5	15	5		5	5			5		15
Vic.ame	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5				5
Vio.adu	5	5	5	5	5	5	5	5	5	5				5	5			5	5	5	5			5	5
Arc.uva			15											15						5	5			5	
Pin.ban	5					5																			
Pop.tre		15	5				5	5				5	5				5							5	
Ros.aci		5			5						5					5					5				
litter	75	25	25	25	35	15	15	15	5	35	15	15	75	45	25	45	15	15	25	25	45	35	25	5	5
rock													5												
bareground		45	55	55	45	5	65	55	75	55	65	55	5	25	55	35	75	75	65	55	55	55	65	75	75

1983.2182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										5											5				
Agr.sca		5	5							5						5									
Bro.spp														5			5	5	5						
Cal.spp		5					5	5	5	35			5	5			5	15	5			15		5	5
Car.spp	5	15	15	5	5	15	15	5	15	5	5	5	5	15	5	5	5	15	15	25	15	15	5	15	15
Dan.int												5				15	15				15				
Ely.spp	5	5	5	5	5	5	5	15	5		5	5	5			5	5	5			5	5	5	5	5
Ely.vil										35	5	15			35	5	5		15	25		5	35	15	5
Fes.hal	5	15	15	5	15	25	5	5	5		15	5				5					15	25		15	5
Hes.spp	25	5	15	25	5			5	25																
Hie.odo	5	5		5	5	5	5	5																	
Koe.mac	5	5	5	5	5	5	15	5	15		5	5				15					15	5	5	5	5
Muh.rac																	5					15	5		5
Ory.spp																		5							
Poa.spp			5					5	5																
Sch.pur										5					15		5	5	5	5					
Ach.mil	5		5	5	5	5		5	5	5	5	5			5		5				5	5	5	5	5
Aga.foe	5																								
Ago.gla	5	5		5	5	5	5		5							5					5		5		
And.sep				5	5	5	5																		
Ane.mul											5														
Ant.spp					5																				
Art.lud		5	15	15	5	5	5	5	5	5	5	5													
Cam.rot	5	5	5		5	5	5		5		5	5				5								5	
Cer.arv	5	5				5	5	5		5															
Com.pal																	5	5	5	5	5	5	5	5	5
Epi.ang														5	5		5	5	5			5			
Eri.spp		5	5				5	5		5						5					5		5	5	
Fra.vir														5	5			5	5						5
Gal.bor	5	5	5	5	5	5	15	5	15	5	5	15	5	5	5	15	15	15	5	15	15	15	5	15	25

Gen.aff	5															5					5			5
Geu.tri			5								5			5										
Hed.alp	5																							5
Heu.ric				5						5				5					5				5		
Hie.spp	5																								
Lat.och	5	5								5			5	5	5	5	5	5	5	5	5	5	5	5	
Lil.phi																							5		
Mai.ste	5	5					5	5						5	5		5	5	5	5		5			
Ort.lut							5				5					5									
Oxy.cam				5	5						5														
Pol.sen																					5				
Pot.arg												5													
Sis.mon	5	5	5		5	5	5	5	5		5	5									5			5	
Sol.can														35			55		15			15		5	
Sol.mis	5	15	5	5	15	15	15	5	5		15	5	5			5	5		5		15	5	5	5	
Ste.lon													5												
Sym.lae												5	5					5	5	5		5	5	5	5
Tar.off													5	5			5								
Tha.ven	5					5	5	5		15		15	15	5	15	5	5	5	5	5	5	15	5	5	5
Vic.ame	5	5		5	5	5	5	5	5	15	5	5	15			5	15	5	5	15	5	5	5	5	
Vio.adu	5	5							5	5	5	5	5		5	5	5	5			5	5	5	5	5
Ame.aln																						5	5		
Arc.uva	15									5			5												
Bet.spp																				5					15
Pop.tre					5			5	15	15	5	15	5	5	25	5	5	5	15	5	5	15	25	5	5
Ros.aci	5		5					5	15	15		5	5	5	5	5		25	15	15	5	5			
Sal.beb																								5	
She.can			15					15						5											
Sym.occ																			5						
litter	15	15	15	15	5	15	5	15	35	75	5	25	5	45	35	15	35	55	25	25	25	45	45	25	35
rock	5		5	5	5		5				5	5									5				
bareground	85	85	75	85	95	85	85	75	35		85	75				65			5	5	65	25	25	65	65

1983.2212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric		5	5		15		5			5	5	5		5	5	15		5		5	5	25	25	15	25
Bro.spp	5	25	5	15	5	15	15	15	5	15	5	5	5	15	15	5	15	5	5	15	5	5	15	15	5
Cal.spp	5									15		5			5									5	
Car.spp	25	15		15	25	25	15	15	15	25	35	25	15	5	25	25	25	15	5	15	15	25	15	15	
Dan.int	5																								
Ely.spp		25	15	15	5	5		5	5	5	5	15	15	15	15	15	5	5	5	15	5	5	15	15	15
Ely.vil	25	15	15	15		15	15	25	15	5	15	15	15			15	5	5			35	15	5	15	5
Fes.hal		5	15		5	15	5	15			25		5		5	15		45	5	5	5	15	5		
Hes.spp					5																				
Hie.odo																									5
Koe.mac	5		5	5	25	5	5	5	25	25	15	15	15	25	15	25	25	15	15	15	5	25	15	25	15
Muh.rac																				5			5	5	5
Poa.spp									5						5					5					
Sch.pur				5		5	5	5	5	5	5	5		5	5						5		5		15
Ach.mil	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5
Aga.foe												25													
Ago.gla		5		5									5							5					5
Cam.rot	5		5			5	5				5		5		5		5		5	5	5	5	5	5	5
Com.pal	5	5	5		5	5	15	5			5		5			15	5				5	5			
Epi.ang																							5		5
Eri.spp																			5	5					
Fra.vir	5				5		5	5	15		5		15	5		5	15	15	5		5	5	15	15	
Gal.bor	5	15	15	15	25	5	15	5	15	15	15	15	15	15	15	25	15	5	15		5	15		25	15
Gen.ama			5		5			5					5		5		5			5	5		5		5
Geu.tri							5						5												
Hed.alp		5				5	5					5				5	5				5				5
Heu.ric	5					5	5				5		5	5	5	5					5		5		
Hie.spp														5					5	5	5				
Lat.och	25	5	5	5	5	15	5	15	5	5	5	5	5	15	5		5	5	5	5		15	15	5	5
Lil.phi							5			5													5		
Mai.can								5								5	5		5		5				
Mai.ste			5	5		5		5	5	5				5	5										
Pol.sen							5										5								
Pot.arg							5		5											5					
Sis.mon			5										5			5	5			5					5
Sol.spa	5		5	5	5			5		5	5	5	15	5	25		5	5	15	15		15		15	

Sym.lae	5		5	5	5	5	5		5	15	5	5	5	5	5	5	5	5	5	5	5		5		5
Tha.ven	5	5	5		5	5				5	5	5	5		5	5	5	5	5	5	5	5	5		5
Vic.ame	5			5		5		15	5		5	5	5	5	5		5	5	5	5	5	5	5	5	5
Vio.adu	5		5	5	5		5	5	5		5			5	5	5	5			5	5		5		5
Ziz.apt	5					5							5		5	5	5						5		5
Arc.uva											5					5						5			
Bet.spp																							5		
Pop.tre	5	5	5	5		5	5	5	15	5	5	5	5	5		5	5	5	5	5	5		15	5	5
Ros.aci	15	5	15	35	15	5	5			5	5			5		5	5						5		5
Sal.beb																			15	5	55				
litter	85	85	85	85	85	85	85	85	85	85	85	85	85	85	75	75	65	65	55	65	85	85	85	75	85
bareground					5			5	5	5	5		5		15	15	25	15	35	15		5	5	15	

1983.2271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				5									5	5				5				25			
Agr.sca	5		5				5		5	5	5		5	5		5	5	5			5		5		5
Cal.spp				5		5	5		5	5		5		5		5	5				5				5
Car.spp	15	15	15	5	15	15	15	15	5	15	15	15	5	5	15	15	15	15	5	15	5	5	5	15	15
Dan.int																5		25							5
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5		5	5	5	
Ely.vil											5	5							5					5	
Fes.hal	15	5	5		5	15	15	15	25	15	5	5	15	15	5	5	5	5	15	5	5	15	15	15	5
Fes.sax							5																		
Hes.spp	15	15	25	15	15	25		5		5				5	35	35	15		5	25	5			15	15
Hie.odo									5	5						5									
Koe.mac	15	15	5	5	5	5	15	5	15	5	25	15	15	5	5	15	5	5	5	5	5	5	5	5	5
Muh.rac																					5				
Muh.spp																							5	5	
Sch.pur									5							5					5				
Ach.mil	5		5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5			5		5
Aga.foe										5											5	5			
Ago.gla				5	5	5	5	5	5	5	5			5	5		5	5		5		5	5	5	
And.sep										5								5	5						
Ane.cyl																									5
Ane.mul																								5	
Ant.spp	5																					5			
Art.lud		5	5				5					5	5			5	5							5	
Ast.lax												5						5							
Cam.rot	5		5		5		5	5				5	5			5	5	5			5	5	5	5	
Cer.arv	5	5			5		5		5							5	5						5	5	
Com.pal	5	5		5	5	5	5	5	5	5	5	5		5	5	5	5	5			5			5	
Eri.spp	5					5		5		5					5					5					5
Gal.bor	5	5	5	5	5	5	5	15	5	15	15	15	5	15	5	5	5	15	5	5	15	5	5	15	5
Hed.alp																				5		5		5	
Heu.ric			5							5							5		5			5		5	5
Hie.spp	5	5	5			5	5								5					5	5	5	5		5
Lat.och									5	5	5		5						5	5	5	5	5		
Lit.can						5								5											
Mai.ste																5				5			5		
Oxy.cam	15	5	5	5	5		5					5						5	5						
Pol.sen														5						5	5	5	5	5	5
Pot.arg															5							5	5		
Pul.mul																						5			
Sis.mon				5			5		5	5						5				5	5	5	5	5	5
Sol.mis	5	5		5	5	5	15	5	15	5	15	5	5	15			15	5	5	5	5	5	15	5	15
Ste.lon													5									5			
Sym.lae						5				5	5		5	5							5		5		5
Tha.ven							5	5	5	5	5	5	5	5		5				5	15	15	5	5	5
Vic.ame		5	5		5	5		5					5		5	5			5		5	5			
Vio.adu	5	5				5	5	5	5	5	5	5		5	5	5			5	5		5		5	
Ame.aln				35	15		5			5					5	5					5	5			
Ros.aci		5	15	5		5								5	5	5		5		5		15	5	5	5
Sym.occ		35	5	15	15		15		5	5		15		5	15	5			25	5	15	5			
litter	45	25	35	25	25	35	25	35	25	35	45	25	15	25	35	25	15	15	15	25	15	15	15	15	15
rock	5	15	5	5	5							5									35				
bareground	45	55	55	45	65	55	65	45	45	35	35	45	65	55	45	55	75	65	75	55	15	75	65	65	65

1983.2272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**

Ach.ric	5	5			15	5				5	5								5						
Agr.sca																									5
Bro.spp												5					5								
Cal.spp			5			5	5		15		5	5	35	35		5	5	5	5				5		
Car.spp	15	15	15	5	5	5	5	5	5	15	5	5	5	5	15	5	5	5	5	15	15	5	5	5	5
Dan.int					15	5				5							5								
Ely.spp	5	15	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5
Ely.vil	5	5	5			5	5	45	5	5	15		5	5		5	5	5	5				15		
Fes.hal	5	15	35	5	5	15	5	5	5	25	5			5	15	5	5	5	5	5	15	15	5	5	5
Hes.spp				15		5														35		5			
Koe.mac	15	15	15	5	5	5	5		5	15	5				5	5		5	5	5	15	5	5	5	5
Muh.rac				5				5														5			
Poa.spp							5					5	5				5								
Sch.pur	5							5	5		5	15	5	5			5	5					5		
Ach.mil	5	15	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5		5		5	
Aga.foe																								5	
Ago.gla	5	5	5	5	5	5	5		5	5	5									5	5	5	5	5	5
And.sep																				5		5			
Ane.cyl																							5		
Ant.spp																					5				
Art.lud											5														
Cam.rot	5		5	5	5		5			5	5			5	5		5					5		5	5
Cer.arv			5		5					5					5					5	5				
Com.pal	15	5	5	5	5	5	5	5	5	5	5		5		5	5			5	5	5	5	5	5	5
Epi.ang								5				5	5			5									
Eri.spp				5											5				5		5	5			5
Fra.vir							5	5	5		5	5	5				5	5							
Gal.bor	5	15	15	15	5	25	15	5	15	15	15	5	15	15	5	15	5	5	15	5	5	15	15	5	5
Gen.aff			5			5	5		5		5			5	5	5		5							
Geu.tri					5																				5
Hed.alp	5	5				5	5		5		5						5	5	5				5	5	
Heu.ric				5			5		5		5		5							5	5	5			
Hie.spp			5				5		5	5						5								5	
Lat.och	5	5				5	5	5	5	5	5	5	5	5	5	5	5	5	5				5	5	5
Lil.phi										5															
Lit.can																				5					
Mai.ste		5				5	5		5				5	5				5	5				5	5	
Ort.lut					5					5											5			5	
Oxy.cam		5	5	5											5					5	5	5			
Pol.sen	5	5	5	5						5	5	5			5				5						5
Pot.arg																						5		5	
Sis.mon										5					5					5			5		5
Sol.can							15	5			15		15				25	25							
Sol.mis	5	5	15	5	15	15	5		5	15				5	5	5	5		5	5	15	15	15	15	15
Son.spp														5											
Sym.cil												15	15												
Sym.lae	5						5	5	5		15	5	5	15		5	15	5		5			5		
Tha.ven	5	5	5		5	5	5	5	15	5	5	5	5	15	5	5	15	5	5			5	5		5
Vic.ame		5	5	5	5	5	15	5	5	5	5	15	5	5	5	5	5	5	5	5		5	5		5
Vio.adu	5	5	5	5	5	5	5	5	5	5	5	5		5		5	5		5	5		5	5	5	5
Ziz.apt	5						5				5					5									
Ame.aln						5					5	5		5											
Arc.uva							15																		
Bet.spp												15				15	5	45							
Lon.dio												5													
Pop.tre	15	15	5	5		5	5	5	5	5	5	5	5	5		5		5	5	5	5	5	5		
Ros.aci	5		5	15		5	5					5		5	15	5			25	15	5	5	5		5
Rub.pub													5												
Sal.beb																5									
Vac.cae								55				5	5				5								
litter	35	35	15	5	5	15	15	25	15	25	25	15	45	35	25	25	25	5	15	15	15	15	15	5	5
rock				25		5									35				5			5			
bareground	15	65	75	65	85	35			5	75					45	55	25	75	75	85	85	75	85	85	95

1983.2281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric		5	25			5	5	5		5			5					5							
Agr.sca	5						5	5	5		5	5	5					5							
Bro.spp					5																				
Cal.spp		5	15	5		5	5	5		5	15	5	5	15	5	15	5	5	5	5	5	5	5		
Car.spp	15	15	15	15	15	15	5	15	15	15	25	25	25	5	5	15	5	5	15	15	5	15	15	15	15

Dan.int	5					5	5	5		5	5	5	5			5	5								
Ely.spp	5	5	5	5	5	5	5	15		5	5		5	5	5	5	5	5	5	5		5	5	5	5
Ely.vil			5		5													5	5						
Fes.hal	35	25	15	35	15	15	25	15	25	25	15	15	35	5	15	15	15	15	25	25	5	25	25	5	5
Hes.spp		5	5											5					5					15	5
Hie.odo			5		5				5					5				5	5			5			
Koe.mac	15	15	15	15	5	15	5	5	5	5	15	5	5	25	5	5	5	5	15	15	5	5	15	5	5
Muh.rac											5					5									
Muh.spp															5		15				45				15
Poa.spp																5								5	
Sch.pur						5						5													
Ach.mil	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5		
Aga.foe		15				5	5					5	5			15	5	5				5	5		
Ago.gla	15	5	5	5		5	5	5		5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5
And.sep														5											
Ane.cyl	5											5										5			
Ane.mul																		5							
Ant.spp		5																							
Art.lud																	5				5	5			
Cam.rot		5	5	5	5	5	5		5		5	5	5	5	5	5	5	5		5			5	5	5
Cer.arv		5	5				5			5			5					5		5					
Cir.arv														5	5										
Com.pal		15	5	5			5	5	5	5	5	15	5	5	5	5	5	5	5	5		5	5	5	5
Epi.ang			5				5						5				5								
Eri.spp	5		5			5	5		5	5	5	5		5			5	5	5	5	5	5	5	5	5
Fra.vir												5				5									
Gal.bor	5	15	15	15	15	5	15	5	5	5		5	5	5	5	15	5	5	5	15	15	15	5	5	15
Gen.aff											5	5													
Geu.tri										5															
Hed.alp	5	5					5	5			5	5				5		5	5						
Heu.ric										5													5		
Hie.spp	5					5		5																	
Lat.och	5	5	5			5		5			5	5	5			5	5	5			5		5		
Lil.phi	5												5												
Mai.ste						5					5	5		5			5		5						
Oxy.cam									5	5					5								5		
Pol.sen	5	5		5		5					5	5					5	5	5						
Pot.arg						5										5	5	5				5			
Sis.mon	5	5		5	5		5		5	5	5		5	5	5				5		5	5	5		5
Sol.can							5				5	5				5	5				5	5			
Sol.mis	5	5	15	15	15	5	15	5	15	15	5	15	5	5	15	5	15	15	5	15	5	5	5	5	5
Ste.lon		5	5					5				5	5				5								
Sym.lae		5	5	5		5	5	5		5	5	5		5		15		5			5	5	5		
Tha.ven	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5	5		15
Vic.ame	5		5				5		5		5	5	5	5	5	5	5	5		5	5	5	5	5	5
Vio.adu	5	5	5	5		5	5	5	5	5		5	5	5	5	5	5	5	5			5	5		
Ziz.apt											5	5				5									
Ame.aln																	5								
Arc.uva																5									
Pop.tre	5										5					5					5				
Ros.aci	5		5												5			5	5	5	5	5	5	5	5
Sym.occ					5					5					5		5		5	5					
litter	15	15	25	25	15	15	25	25	5	25	25	25	35	15	5	15	15	15	15	25	5	15	25	5	15
bareground	65	75	55	65	75	65	55	75	85	65	45	55	55	75	75	65	75	75	75	65	75	75	75	85	75

1983.2282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric	5	5			5		5		5	25		15		5	5			5	5	15		5	5		5
Agr.sca																					5				5
Bro.spp	5							5						5					5						
Cal.spp		15		25	5	5	5		25	5		5	5	15	5	15	25	5	5			5	5		5
Car.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	15	5	5	5
Dan.int	5						5		5					5				5			5	5	5	5	
Ely.spp	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ely.vil	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5					5	5	5		
Fes.hal	5			5	15	5			5	15		5	5	5	5	5	5	5	5	15	5	15	5	25	25
Koe.mac	5	5		5	5		5		5	15		5	5	5	5	15	5	5	5	5	5	5	5	15	5
Muh.rac									5																5
Ory.spp		5																							
Poa.spp	5								5																
Sch.pur	5		5	5		5	5		5		5					5	5		5						

Ach.mil	5	5		5	5	5	5		5	5	5	5		5	5		5	5	5	5	5	5	5	5	5	5
Aga.foe			5												5				5				5		5
Ago.gla	5			5	5					5		5			5	5				5	5	5	5	5	5
Ane.mul																								5	
Ant.spp	5																								
Cam.rot					5					5		5	5					5			5		5		5
Cer.arv		5																5		5		5			
Com.pal		5		5	5	5	5		5	5	5	5	5	5	5			5		5			5	5	15
Epi.ang				5					5										5			5			5
Eri.spp					5											5			5	5	5	5			5
Fra.vir	5	5	15	5	5	15	15	5	5		5	5	5	5	5		5	5				5	5		
Gal.bor	5	15	5	15	5	5	5	5	15	15	15	15	5	15	5	5	15	5	5	5	5	5	15	5	5
Gen.aff	5		5	5			5	5		5		5			5	5	5	5					5		5
Geu.tri		5																							
Hed.alp	5		5	5	5	5	5	5		5	5	5		5			5		5		5	5	5	5	5
Heu.ric								5			5						5	5					5		
Hie.spp	5		5	5												5		5				5	5		
Lat.och	5	5	5	5	5	5	5	5	5		5	5	5	5				5	5		5	5	5		
Lil.phi																						5			
Lit.can	5			5			5		5	5					5								5		
Mai.ste	5	5	5				5	5	5	5	5	5		5		5	5	5			5	5	5	5	
Ort.lut					5															5	5				
Oxy.cam													5		5							5			
Pol.sen	5	5		5	5		5			5		5	5		5	5	5	5	5	5	5	5	5	5	5
Pot.arg	5				5		5		5		5		5		5		5		5		5			5	
Sis.mon					5							5							5		5	5	5	5	5
Sol.can			5	5		5					5		15			5							5		
Sol.mis	5	5		5	5					5	5		5		5	5	5	15	5	5	15	5	15	5	15
Son.spp					5																				
Ste.lon																								5	
Sym.lae	5	15	5	5			15	5	15		5	15	5		5			5	5				5		5
Tar.off			5		5			5																	
Tha.ven	5	15	5	15	5	15	5	5	15	15	5	5	5	15	5	5	5	5	15		5	5	15		5
Vic.ame	5	5	5			5	5	5	5		5	5	5	5	5		5			5	5			5	5
Vio.adu	5		5	5	5		5	5	5	5			5	5	5	5	5	5	5		5	5	5	5	5
Ziz.apt			5				5		5		5	5					5								
Zyg.ele												5											5		
Ame.aln			5			5				5	5							5	15						
Arc.uva								5	5	25			25		15										
Bet.spp			35		15		5	5						5											
Pop.tre	5	15	35	5	5	5	25	25	25	5	15	5	5	15	5	25	25	5	5	5	5		15	5	
Ros.aci	5	15		15	5	5		15	5		5	5	5			15		5			5		5	5	
Sal.beb								5						5					5						
Vac.cae						5																			
litter	15	15	5	65	25	65	25	5	55	25	15	15	55	25	15	65	45	15	15	5	5	15	5	15	15
rock																				5					
bareground	85	75	25	5	45				45	55		55	5	45	45	15	35	75	75	85	85	75	75	85	85

1983.3111	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric											5	5	5			5	5	5			5	5		5	
Agr.sca										5												5			
Bro.spp				5						5															
Cal.spp																		5				5			
Car.spp	5	5	5	5	5	15	15	15	5	25	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5
Dan.int								5								5									
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ely.vil	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fes.hal	15	5	5	5		15	5	5		5	15	15	5	5	5	5	5	5	5	5	5	15	5	5	5
Hes.spp						5																			
Koe.mac	5	5	5	5	5	15	25	15	5	5	15	15	15	5	5	5	5	5	15	5	25	15	15	5	15
Ory.spp				5	15			5	15	5			5	5											
Sch.pur				5	5			5	5					5	5			5	5	5	5		5	5	5
Spo.spp											5	5				5								5	
Ach.mil	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ago.gla		5	5				5	5			5	5	5	5	5	5		5	5		5	5		5	5
Cam.rot	5		5			5	5	5			5	5	5		5	5	5	5	5	5	5	5	5	5	5
Com.pal	5	15	5	5		15	15	5	5	5	5	5	5	5	15	5	5	5	5	5	5	15	5	15	5
Epi.ang				5				5																	
Fra.vir	15	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5		5		5	5	5		5
Gal.bor	15	15	5	5	5	15	15	5	5	5	5	15	5	5	5	15	15	15	15	15	15	15	5		5

Gen.aff		5	5	5	5		5	5	5	5		5	5	5		5	5	5	5	5			5	5	5
Hed.alp	5	5	5	5	5		5		5		5				5	5	5		5	5	5	5		5	5	5
Heu.ric						5																5				
Hie.spp			5										5	5		5					5	5	5		5
Lat.och	5							5	5	5	5					5	5				5			5	
Lat.ven				5	5		5								5			5		5			5		
Lil.phi										5					5	5							5		
Lit.can	5	5						5			5	5	5	5		5			5		5				
Mai.can				5	5									5	5										
Mai.ste	5	5				5					5					5									
Ort.lut															5										
Pol.sen	5	5	5	5	5		5	5	5	5	5	5		5		5	5	5	5		5	5	5	5	5
Pyr.asa		5	5	5	5			5	5	5				5	5										
Sis.mon		5				5							5												
Sol.can	5				5	5	5	5	5	5				5	5				5	5					5
Sol.mis		5	5			5		5			5	5	5	15			5	5	5		5	5		5	
Sym.cil				25	15			5	15	15															
Sym.lae	5	5	15	5	5		5	5		5	5	15	15	5	5	5	5	15	5	5	5	5	15	15	15
Tar.off					5										5										
Tha.ven	5	5	5	15	5	5	5	15	5		5	5	5	5	5	5	5	5	15	5	5	15	5	5	5
Vic.ame			5	5	5			5	5	5					5					5		5	5		5
Vio.adu		5			5	5	5	5	5		5	5	5		5	5	5	5	5	5	5	5	5	5	
Ziz.apt		5					5						5			5		5	5		5				
Zyg.ele		5														5									
Ame.aln		5	5	5	5	5	5	5		5		5	5	5						5		5	5	5	5
Arc.uva		5						5			15	15	25			35	45	25	15		5		25	5	5
Bet.spp		5		5	5			5	55	15		5		25	45			5		45					55
Pop.tre	5		5	15			5	5	5	5			5			5		5		5				5	5
Ros.aci	5	5	5			5			5			5			5		5		5		5	15			
Sal.beb					15									15	5										
She.can				5					5																
Vac.cae			5	5	5			5	5	5	5	5	5					5						5	
litter	45	5	15	15	55	15	25	35	25	55	25	15	15	15	15	15	15	5	5	5	15	25	5	15	5

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Ach.ric						5				5					5			5							
Agr.sca																			5						
Bro.spp	5		5	5	5	5	5	5	15	5	5	5	5	15	5		5	5	5	5			5		5
Cal.spp	5		5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Car.spp	5				5	5	5	5		5		5	5	5	5	5		5	5	5	15	5	5	5	5
Ely.spp			5	5	5	5	5	5	5	5			5	5	15	5		5	5	15	5	5	5	5	
Ely.vil	5		5	5	5	15	5	5	5	5	5	5	5	5	5	5	15	15	5	5		5	5	5	5
Fes.hal			5		5					15				15	15	5	5	5	15	5	35	5	5	5	5
Koe.mac		5	5	5	15					15	5		5	5	15	5					15	5			5
Muh.rac									5					5											
Ory.spp		5	5		5			5	5		5				5	5	5				5			5	
Poa.spp							5		5									5							
Sch.pur	15	5	5	5	5				5	15	5	15	5	15			5	5	15		5		5	5	5
Ach.mil	5		5	5	5	5	5		5	5			5	5	5	5	5	5	5	5	5	5	5	5	5
Ago.gla															5										
Agr.str			5		5																				
Ara.hir					5																				
Cam.rot					5								5	5		5		5	5	5					5
Com.pal			5	5	5				5	5			5	5	5	5	5		5	5	5	5		5	
Epi.ang		5				5		5	5			5	5				5								
Fra.vir	5	5	5	5	5	15	15	15	15	15	5	5	15	5	5	15	15	15	5	15	5	15	15	15	15
Gal.bor	5	5	5	5	5	5	5	15		25	15	15	15	15	15	15	5	15	5	25	5	5	5	15	
Gen.aff						5																			5
Hed.alp	5										5		5			5	5			5	5		5		
Heu.ric					5		5		5				5						5						5
Lat.och		5				15	5	5	15	5	5	5	5	15	5	5	5	5	5	5	5		5	5	5
Lat.ven	5		5	5	5																				
Lil.phi																5	5					5			
Mai.can	5	5		5			5		5		5					5									
Mai.ste				5					5			5									5	5	5		5
Muh.obl																									5
Pol.sen					5									5	5	5					5				5
Pot.arg								5	5	5					5			5	5	5					
Pyr.asa	5	5		5	5	5	5		5							5	5			5		5		5	5
Sis.mon					5													5							

Sol.can	15	5	65	75	5	15				5	55				5	25	15	15	15		5	15		5	25
Sol.mis															5				5			5			
Son.spp				5								5													
Sym.cil	5	5	25	15	35	15	5	15		5	5		35	35		5	25	5	5	5		5	15	5	5
Sym.lae				5	5	5		5		5	5		5	5	5	5		15	5	15	5			5	5
Tar.off			5																5						
Tha.ven	5		5	5	5	5	5	5	15	5	5		15		5			5	5	5	5	5	5	15	
Vic.ame	5	5	5	5	5	5	5	5	15	5	15		15	5	5		5	5	5	5	5	5		5	5
Vio.adu				5	5		5	5		5		5			5	5		5	5	5	5				
Ziz.apt				5	5						5			5											
Ame.aln	5					5	5		5			5	5									5			
Bet.spp	5	75		5				25	15			25				35		15				5	15	5	
Lon.dio				5															5	5			5		5
Pop.tre	15	25	15	5	5	15		15	15	5	5	5	15	5	5	5	15	5	5			5	5	5	5
Ros.aci	15	15	5		5	25	15	15	15	5	5	5	15	5	5	5	5	5	5	5	15		5	5	5
Sal.beb	5			5		5	35	15		5			5	5			25				5	15	65		5
Sym.occ	5										5	15					15	5				5	5	5	
Vac.cae	5	5	5		25	5	5	5	5	5	5		5	5		5		5	5	5					5
litter	95	55	85	35	15	75	75	75	35	15	15	35	15	25	25	15	45	45	45	45	25	35	45	25	35
bareground				25	25					35	15	15	55	45	65	25	15	15	15	35	55	55		25	25

1983.3211	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca							5														5				
Bro.spp					5			5	15	15	15	15	5	5	5						5	5	5	5	
Cal.spp								5	5	5	15	5	5	5		5		5	5		5				
Car.spp	15	15	25	15	25	25	5	15	25	15	15	25	15	5	15	15	15	15	5	15	25	25	15	15	25
Ely.spp	15	5	5		15	15	5	15	15	15	15	5	5	15	5	5	15		5	5	5	5	5	15	15
Ely.vil							5	5				5	5												
Fes.hal	15	15	35	55	15	5	5	35	15	15	15	5	5	35	45		15	15	5	55	15	25	15	35	55
Koe.mac	15	15	25	15	15	15	5	5	15	5	15	5	5	35	15	5	15	15	5	25	15	15	15	25	15
Ory.spp		5				5	5	5	5	5	15	15	5	5	5	25	15	5	5	5		5		5	
Poa.spp										5															
Sch.pur	5						5		5	5	15	15	5	5		15	5	5	5		5	5	5		
Ach.mil	5	5	5	5	5	5		5	5	5	5	5	5	5	15	5	5	5		5	5	5	5	5	5
Ago.gla			5		5	5			5					15	5					5			5	5	
Ara.hir												5													
Cam.rot	5	5			5	5		5		5			5	5	5		5		5	5	5		5	5	5
Com.pal	15	15	15	15	15	15	5	15	15	15			5	25	25		15	15	15	15	5	15	15	15	15
Epi.ang									5		5					5					5				
Fra.vir	5	15	5	5	5	5	5	15	15	5	15	15	15	15	15	15	5	15	5	15	5	5	15	5	5
Gal.bor	5	15	15	15	5	15	5	15	5	15	5	5	15	15	15	5	15	15	5	15	15	5	5	15	25
Gen.ama	5		5	5	5	5		5	5	5	5	5		5	5	5		5	5		5	5	5	5	
Hed.alp	5	5	5	5	5	5		5	5	5	5	5	5		15	5	5	5	5	5	5	5	5	15	15
Hie.spp	5		5		5		5	5							5					5		5	5	5	
Lat.och				5	5	5	5	5	5	5	15	15	15	5	5	15	5	15	5		15	5	5	5	
Lil.phi	5			5	5	5	5	5							5					5	5		5	5	
Mai.can		5		5	5		5	5	5		5	5	5			5					5	5		5	
Mai.ste			5	5				5		5					5										
Muh.obl												5													
Ort.lut							5					5													
Ort.sec	5			5	5	5		5		5	5	5		5	5	5	5	5	5		5	5	5	5	
Pol.sen		5	5		5	5	5	5		5		5	5	5	5	5	5		5	5	5	5	5	5	
Pot.arg					5						5														
Sis.mon								5	5						5		5								
Sol.can	5	5				5	5	5	5			15	15		5	15	25	15	5		15	5	25	5	
Sol.mis	5	5				5	5		5	5	5	5	5	5	5	5				5		5	15		15
Sol.rig	5			5																		5		5	
Son.spp																5					5				
Sym.cil							15		25	15	5	5	15	5		25	15	15	5		15		5	5	
Sym.lae	5	15	5	5	15	5	5	15	5	5	5	5	15	5	5	5	5	5	5	5	5	15	5	15	15
Tar.off												5									5				
Tha.ven	5	5	5	5	5	15	5	15	5	5	15	5	5	5	5	5	15	5	5			5	5	5	5
Vic.ame		5		5	5	5	5	5	5	15	5	15	15	15		15	15	15	15	5	15	5	5	5	
Vio.adu			5				5	5		5			5	5		5				5		5			5
Ziz.apt	5	5	5		5	5						5			5		5		5	5		5	5		5
Ame.aln	5	5	5	15	5	5	5	15		5	15		5		5		5	5		15	15	5			5
Arc.uva	15					25																			
Bet.spp		5					65		45	45	5	45	5			15	5	25	55	5	25	35	45	25	
Lon.dio																5									
Pop.tre	5	5	5	5	5	5		5	5			5		5	5	15				15	5	5	5	5	

Ros.aci				5			5	15	5	5			5	5	5	5		15	5	15					
Sal.beb				5	15			5			25	15	35			35			35		5				
Sym.occ				5								5	5			5				5	15	15			5
Vac.cae	5	15			15	15	5			5	5	5		5	15	5	15	5	15	5	5	5	5	5	5
litter	55	25	25	35	45	25	15	35	35	15	15	25	15	35	35	45	35	35	15	15	85	15	15	25	15
bareground	25	15	25	25	5	25	25	5	15	5	45	15	35	5	35		25	15	15	25	5	25	45	55	55

1983.3212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric											5	5	5			5	5	5			5	5		5	
Agr.sca										5												5			
Bro.spp				5						5															
Cal.spp																		5				5			
Car.spp	5	5	5	5	5	15	15	15	5	25	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5
Dan.int								5								5									
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ely.vil	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fes.hal	15	5	5	5		15	5	5		5	15	15	5	5	5	5	5	5	5	5	5	15	5	5	5
Hes.spp						5																			
Koe.mac	5	5	5	5	5	15	25	15	5	5	15	15	15	5	5	5	5	5	15	5	25	15	15	5	15
Ory.spp				5	15			5	15	5			5	5											
Sch.pur				5	5			5	5					5	5			5	5	5	5		5	5	5
Spo.spp											5	5				5								5	
Ach.mil	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Ago.gla		5	5				5	5			5	5	5	5	5	5		5	5		5	5		5	5
Cam.rot	5		5			5	5	5			5	5	5		5	5	5	5	5	5	5	5	5	5	5
Com.pal	5	15	5	5		15	15	5	5	5	5	5	5	5	15	5	5	5	5	5	5	15	5	15	5
Epi.ang				5				5																	
Fra.vir	15	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5		5		5	5	5		5
Gal.bor	15	15	5	5	5	15	15	5	5	5	5	15	5	5	5	15	15	15	15	15	15	15	5		5
Gen.aff		5	5	5	5		5	5	5	5		5	5	5		5	5	5	5	5			5	5	5
Hed.alp	5	5	5	5	5		5		5		5			5	5	5		5	5	5	5		5	5	5
Heu.ric						5															5				
Hie.spp			5										5	5		5					5	5	5		5
Lat.och	5							5	5	5	5					5	5				5			5	
Lat.ven				5	5		5								5			5		5			5		
Lil.phi										5					5	5							5		
Lit.can	5	5						5			5	5	5	5		5			5		5				
Mai.can				5	5									5	5										
Mai.ste	5	5				5					5					5									
Ort.lut															5										
Pol.sen	5	5	5	5	5		5	5	5	5	5	5		5		5	5	5	5		5	5	5	5	5
Pyr.asa		5	5	5	5			5	5	5				5	5										
Sis.mon		5				5							5												
Sol.can	5				5	5	5	5	5	5				5	5				5	5					5
Sol.mis		5	5			5		5			5	5	5	15			5	5	5		5	5		5	
Sym.cil				25	15			5	15	15															
Sym.lae	5	5	15	5	5		5	5		5	5	15	15	5	5	5	5	15	5	5	5	5	15	15	15
Tar.off					5										5										
Tha.ven	5	5	5	15	5	5	5	15	5		5	5	5	5	5	5	5	5	15	5	5	15	5	5	5
Vic.ame			5	5	5			5	5	5					5					5		5	5		5
Vio.adu		5			5	5	5	5	5		5	5	5		5	5	5	5	5	5	5	5	5	5	
Ziz.apt		5					5						5			5		5	5		5				
Zyg.ele		5														5									
Ame.aln		5	5	5	5	5	5	5		5		5	5	5						5		5	5	5	5
Arc.uva		5						5			15	15	25			35	45	25	15		5		25	5	5
Bet.spp		5		5	5			5	55	15		5		25	45			5		45					55
Pop.tre	5		5	15			5	5	5	5			5			5		5		5				5	5
Ros.aci	5	5	5			5			5			5			5		5		5		5	15			
Sal.beb					15									15	5										
She.can				5					5																
Vac.cae			5	5	5			5	5	5	5	5	5					5						5	
litter	45	5	15	15	55	15	25	35	25	55	25	15	15	15	15	15	15	5	5	5	15	25	5	15	5

1995.0311	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca					5				5			5						5		5					
Cal.spp												5							5				5		
Car.spp				5	5	5	5	5		5							5	5		5		5			
Dan.int												15				5	5	5		5	5	5		5	

Ely.spp	5	15	5	5	15	5	5	5	5	5	25	15	25	15	5	5	5		5	5	15	25	15	15	5
Ely.vil					5					5					5	5								5	5
Fes.hal	15	15	35	25	45	15	5	5	5	5	5	25	15	5	45		5	5			15	5	25	25	35
Hel.hoo									5																
Hes.spp			5															5	15	5			15	5	
Koe.mac	5	5					5			5															
Muh.spp								5																	
Ory.spp						5	5	5	15	5	5	5				15									
Poa.spp													5												
Sch.pur							5																		
Ach.mil		5			5	5		5	5	5	5	5	5		5	5	5				5	5	5	5	5
Aga.foe	5	5				5					15	5	5	15	15										
Ago.gla					5		5					5			5	5		5							5
All.spp			15																	5					
Ant.spp																									15
Art.cam	15																								
Art.lud	5		5	5		5	5													5				15	5
Cam.rot	5	5	5	5			5	5	5	5	5		5			5	5	5	5	5	5				5
Com.pal		15	5	5	15		5	5	5	5	15						5	5	5	5	5	5			5
Cre.tec						5	5		5		15				15		5				5	5			
Eri.spp							5						5		5					5				5	5
Fra.vir	5									5	15			5	5										
Gal.bor	5	25	15	15	25	5	15	15	5	5	5	15	5	15	5	5	5	15	5			5	15	15	15
Geu.tri													5				5	5	15	5		15	5	15	5
Hed.alp						5	5	5		5	5		5			5	15	5			5				
Heu.ric				5																				5	
Lat.och					5	5		5	5	5	5	5	5		5	5	5		5	5	15	15			
Mai.ste															5										
Ort.lut						5																			
Oxy.cam			5																5	5	5			5	
Pot.arg		5						5	5	5		5													
Sis.mon					5					5															
Sol.can						5	5	5		5					25				5						
Sol.spa	5			5	5	5	5	5		5		5	5		5	5	5	5	5	5	15	5			15
Sym.lae	5	15		5	15	5	5		5	5	5	15	5	5	15	5		5					15		5
Tar.off															5										
Tha.ven	5	5		5		5	5	5	5	5	5	5	5	5	5	5			5	15	15				5
Vic.ame	5				5		5	5	5	5			5	5		5	5	5		5	5		5		5
Vio.adu	5				5		5	5						5		5	5	5	5	5					
Ziz.apt										5			5			5						5			
Ame.aln	5	15	15	15	15	15		5	15	5		15	5		15	15				5	15				
Arc.uva											25	35				5	15				25		5	15	
Pin.ban																5	5								
Pop.bal													5									5			
Pop.tre														35		15	5								15
Ros.aci	15	35			5				5	5				15	5	5	5	15	5	5	25		35	25	5
Sym.occ	45	25	5			15			5									5			5	15	5	5	
litter		5	5	15	5	5	15	5	15	5	5	5	15	5	5	5	15	5			5	15	15	5	5
rock																					5			15	
bareground	15		5		5	5	5	5				5	15	5	5	5	5	5						5	15

1995.0312	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp													5				5								
Car.spp				5																		5			
Ely.spp	5	5	5		15					5			5		5				5	15					5
Ely.vil				5		5	5	5			5	15		5		15	15		5	5	15	5	15	5	5
Fes.hal															5					5					5
Muh.spp						5			5																
Ory.spp													5						5			5			
Poa.spp							15			15								5							
Ach.mil		5								5	5	5	5					5		5					
Aga.foe	5	15		5	15					5			5	15	5				5					15	5
Ago.gla					5										5					5					5
All.spp																						5			
Ame.rot												5		5					5		15		15		
Art.lud										5															
Cam.rot		5																		5					
Com.pal	5																								
Cre.tec															5										
Epi.ang										5															

Fra.vir			15	5				5			5	15	5	25	5	5	5	5	5		5	5	5		
Gal.bor	5	5	5	5		5	5	5		5	5	5	5	5		5	5	5	5	5		5		5	5
Geu.ale																	5				15				
Geu.tri										5										5					
Hed.alp		5																			25				
Heu.ric							5						5	5											
Hie.spp										5															
Lat.och	15	15		15	15	5			5	5	25	15	5	5	15		5		5	5		5			15
Lil.phi																	5								
Lit.can							5													5					
Lys.cil			5						5			15		15				5							
Mai.can													5					5	5				5		
Mai.ste		5				5			5	5	5			15					5	5		5		5	
Mon.fis		15					5		5																5
Ort.lut					5																				
Pol.sen																			5						5
Pyr.asa												15	5		5	5	5	5			15		15		
Sol.can	25	15	15					5						15	15			5	5						
Sol.mis				5									5												
Sol.spa				5																					
Sym.cil																		5				5			
Sym.lae			25		5	5		5		5			5	15	15	5	5	5	5	5			15	15	5
Tar.off					5							5								5		5			
Tha.ven													5	15		5		5		5		5	15	25	15
Vic.ame	15	15	15			5	5			5		15	5	15	5		5		5	5	5		5	15	
Vio.adu						5			5									5				5			5
Ziz.apt																		5							
Ame.aln	15	15	25	25	35	25	25	25	25	5	15	15	15	15	35		5	5	5	5			15	55	25
Arc.uva															5					15					
Bet.spp																15	5	5			15			15	
Lon.dio			5				5		5			15				5		5	5	5					
Pop.bal				5																		5			
Pop.tre	25	25		5		85	15	25	85	5	35					35					5		5		35
Pru.vir	25	15			15				15				5	15									15		
Ros.aci	15	15		5	15	15			5	15	25		15	15	15	5	15	5	5	15	5	5	15	25	25
Sym.occ	15	15	25	5	5		5	15	5	5	15	5	5	5	5			5	5	5		5	5		
litter	5	15	15	25	15	25	15	65		5	25		25	25	15	35			25	5		55	25	25	15
bareground				25		5				15			5			5				5		5	5		5

1995.1171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5						5		5	5				5			5	5	5	5		5	5	5	5
Cal.spp																									5
Car.spp	15	5	15		5	5	5	15	5	5	5		15		5	5	15	15	5	5	5	5	5	25	15
Ely.spp	5	15	5	5	5	5	5	5	5	15	5	5	5	5	15	5	5	5	5	5	5	25	5	5	5
Ely.vil										5															
Fes.hal	15	25	5		5	5	5		5		5	15		15	15	5					25	5	5		
Fes.sax													5				5	5	5			5		5	15
Hes.spp																			5					5	
Koe.mac										5							5	5	5	5		5			
Ory.spp												5			5							5			
Poa.spp																			5						
Poac.unk											15			15											
Ach.mil	5	5		5	5	5	5		5	5			5	5		5							5		
Aga.foe					15					5					5		5				5	5			
Ago.gla			5	5	5	5	5			5					5	5	5	5	5	5	25		5	5	5
Ane.cyl										5					5						5				
Ane.mul			5	5	5								5	5						5		5		5	
Ant.spp			5	15			5		5	5		5	25					25		15	15		15	15	25
Art.cam																								5	
Art.lud					5																				
Cam.rot		5		5				5		5	5		5		5	5	5	5				5	5		
Che.alb																								5	
Coe.vir					5																				
Com.pal	5		15	5	5	5	5	5	5	5	5	5	5	5	5	5		5		5	5	5	5	5	15
Cre.tec			15			5				5	15				5				5		5		5		
Eri.spp	5	15		5																		5			
Fra.vir						5						5		5		5			5	5	5	5	5	5	5
Gai.ari																						5			
Gal.bor	5	15	15	5	15	5	15	15			15	5	5	15	15	5	25	5		5	15	5		5	15
Hed.alp	15	15	5				5	5	5		5					5	5	5		5		5	5	5	

Heu.ric															5										
Lat.och					5	5		5		5	5	5	5	5	5	5	5				5	5			5
Lit.can																				5					
Mai.ste										5		5		5			5			5					5
Ort.lut													5												
Oxy.cam			5	5		5			5	5		5						5		5				5	
Pol.sen		5					5	5	5		5		5	5	5		5		5	15	5	5	5	5	5
Sil.dru																							5		
Sis.mon									5																
Sol.can						5																			
Sol.spa	15		25	5	15	5		5	5	5	5	5	5	15	15	5	5	5	5	5	15	5	15	5	5
Ste.lon																									5
Sym.lae	5	15		5	15	5	5	5	5			5		25			5					5			
Tha.ven	5	5			15	5	5		5	5		5		5	5		5			5	5	5	5	5	
Vic.ame				5		5	5		5	5	5		5			5	5	5	5			5			5
Vio.adu	5	5	5	5			5	5	5	5			5	5	5	5	5		5	5	5	5		5	5
Zyg.ele																		5							
Ame.aln	25				15				5	5		15		15	5								15		5
Arc.uva		25	15			55	45	45	25		35	15				45					15				
Pop.bal																								5	
Pop.tre						5															15				
Ros.aci				5			5							5				5		5				5	
litter		5		15		5	5	5		5	5	5	5	5	5		5		15	5	15	5			5
bareground	15	5	15	5	5	5	5	5	5			5	5	15		5			5	5	5		15		5

1995.1172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp																						15			
Cal.spp																				5				5	
Car.spp	5	5		5	5				5		5				5						5				
Dan.int											5														
Ely.spp	5	5	5	15	5	15	5	5		5	5	5	25	15	5	5	5		5	5	15		5	5	5
Ely.vil			5			15		25	15	5	5	15		15	15	5	15	15	5			65	5	5	15
Fes.hal	5	5	5		5		25			15	5	5			5	5				5					35
Fes.sax		5																							
Ory.spp										5															
Ach.mil	5	15		5	5	5		5	5	5	5	5	5	5	5	5				5		5			5
Aga.foe	15					15																			
Ago.gla			5	5	15		5	15		5	15			15											
Ane.mul				5			5																		
Ant.spp																5									
Cam.rot	5	5		5		5	5	5						5		5									5
Coe.vir														5											
Com.pal	15			5		15	5			15					5					5					15
Cre.tec					5		5									5				5					5
Epi.ang													5				15						5		
Eri.spp										5															
Fra.vir		5			5	5	5	15	5		15	15	5			5	5	5		5		5			5
Gal.bor	25	15	25	5	25	5	35	25	15	25	15	15	5		15	15		5	5	15	5	5	5	5	25
Hed.alp	5		15	5	15		5	15	15		15					15				5		5	5		
Lat.och				5		15	5	5	5	5	15		5		5	5					15	5	5	5	5
Lit.can				5																					15
Lyc.spp																			5		5				
Mai.can					5			15	5	15				15	25										
Mai.ste						5					5									15					
Oxy.cam					5		5			5	5	15													
Pol.sen		5		5	5		15	5			5	5			5	5				5					
Pyr.asa							5	5	15																
Sis.mon				5																	55				
Sol.can			35			25		5						5		35			25				5		
Sol.mis													5									5			
Sol.spa	25	15		5			5	5		5	15	15		5	5		5	15							25
Sym.cil												5				5		5				5	5	5	
Sym.lae	5	5	15	5	25			15	15	15	15		5	5	15	5		5		5	15	5			15
Tar.off								5									5								
Tha.ven		5	5		5	5	15		5	5				5	5	5	5	5	15	5	5	5		5	5
Vic.ame	5	5		5	15		5	5	15	5		5	5	5		5			5	5	5		5	5	5
Vio.adu	5		5	5	5	5		5	5			5				5	5	5			5	5			5
Ame.aln		5			5	5	15		35	15			35				15	25		25			5	5	
Arc.uva			35		45	15	25	15	15		15	5		15	5					35	5				
Pop.bal																									5

Pop.tre	25					15	25	15	15	25	25	35	55	15	25	15				5		25	65	25	35
Rib.oxy																						5	5		
Ros.aci				5	5	5				25	5	5	15	15	15	15	15	15	15	5	45	15	5	5	
Sym.occ		15	15				15				5						15	15	25		5		5	15	15
Vac.cae																								5	
litter	15	5	5	15	5	5	5	15	25	15	15	15	25	15	5	5	15	35	25	5	15	25	25	15	15
bareground	5	5								5	5	5					5	5	5	15	5	5			5

1995.1181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		5	5		5		5	5	5	35				5	5	5		5	5	5	5				5
Car.spp	5	5	5	5		15	5	5	5										5						5
Dan.int																							15		
Ely.spp	5	5	15	15	5	15	15	15	5	5	5	15	5	15	5	5	25	5	15	5	5	5	15	5	5
Ely.vil						25			5	15					5										
Fes.hal	35	35	55	35	25	15	35	45	35	15	35	25	15	5	25	35	15	15	15	15	25	15	5	25	35
Fes.sax										5										5					
Hes.spp		5			5						25	25					15	5	15		15				
Ory.spp																							5	5	
Ach.mil	5		5			5					5		5		5	5	5		5	5	15	5			5
Ago.gla	5	5	5				15	15	15		5	5		5	15	15							5	5	
Ane.can																			5						
Ane.cyl		5																	5						
Ane.mul							15	5							5			5		15					
Ant.spp		15	15				15		15					5	15							5			
Art.lud												15					5				5				
Cam.rot		5			15			5			5	5				5	15		15		15		5	5	
Com.pal	5	5	15	5				5	5				5	5	5	15		5	15	5	15	5	5	5	
Cre.tec	15	5	5		5			5	5			15					15						5	15	5
Eri.spp																			5						
Fra.vir	5							5																	
Gal.bor	15	25	15	5	15	5	25	15	25	25	15	15	15	25	15	15	25	25	15		15		15	15	15
Geu.tri												15	5								15	5			
Hed.alp	5	15	5		5		15		15					5	15	5	5						15		
Heu.ric				5				5													5				
Lat.och	5	5	5	5		25	5		5						15			5	5				15	5	
Lit.can													5									5			
Mai.ste	5																								
Oxy.cam				5	25			15	35	15		15						15		5	5			15	15
Pol.sen		5		5	5	5							5								5	5	5		
Pot.arg								5											5	15					
Sis.mon	5		5										5												
Sol.spa	15	15	15	5	15		15	15	15	15			5	15	15	15		25	5		5	5		15	15
Sym.lae		5	5		5	5	25					5			5	5			5	5	5				
Tar.off																		5							
Tha.ven	5	5	5			5	15	15	5		15		5	5		5			5			5	5	5	
Vic.ame	5	5	5					5			5	15	5				5					5			
Vio.adu	5		5	5		5	5	5		5	5		5	5	5	5	5	5	5			5		5	
Ziz.apt	15			5																					
Zyg.ele							5	15	5														5		
Ame.aln			15									15										5			
Arc.uva	25			15	35						35			35			35						25	5	
Pop.tre																						5			
Ros.aci	5			5		5				15	5					15	15			5	5	5			
Sym.occ				5	5				5									5				5			5
litter	5	15	5	5		15	5	5	5	5	5	15	15		15	15	5		5		5	5	5	5	5
rock																				5					
bareground			5	5	5	5	15		5	15		5	5	5	5	5		5	15	5		5	5	5	5

1995.1182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5	5	5			5											5								
Bro.spp												5											5		
Cal.spp							5													25					
Car.spp	5	5	5			5									5	5					5		5		
Dan.int					5																				
Ely.spp	5	5	5	15	15	15	5	5	5	5	5	5	15	5	15	5	5	5	5	5	5	5	5	5	5
Ely.vil											5	5		5	5		5			5					
Fes.hal	5	5	15	5	5	5	5	5	5	5	15	5	5	15	15	5	5	5	5	5	15	15	5	15	15
Koe.mac		5				5						5			5						5		5		5

Ory.spp					5					5			5			5									
Sch.pur															5								5		
Ach.mil		5	5		5		5	5		5		5	5	5		5	5	5					5		5
Aga.foe															5										
Ago.gla	5	5			5	5			5					5			5	5					5		
And.sep																5									
Ane.can																						5			
Ane.cyl															5						5			5	
Ane.mul	5			5					5		5	5						5	5		5	5			5
Ant.spp		5	5																		5				
Art.cam																						5			
Art.lud	5																								
Cam.rot			5					5	5	5	5	5	5			5					5		5	5	
Com.pal	5	5	5			5	5	5	5	5	5		5	5	5	5	5		5	5	5	5	5	5	5
Cre.tec			5		5		5	15	5	5	5			5	5		5	5	5	5	5		5		
Epi.ang				5																					
Eri.spp																					5				5
Fra.vir											5	5					5								
Gal.bor	5	15	5	5	5	5	5	5	5	5	5	15	5	5	15	5	5		5	5	5	5	15	5	5
Hed.alp			5	5	15	15	5	5			5		5	5	5		5		5	5	5	5		5	
Heu.ric							5									5									
Lat.och		5		5	5		5	5	5	5	5	5		5	5		5	5	5	5			5	5	
Lit.can									5	5				5		5						5			
Mai.ste		5																						5	
Ort.lut																				5	5				
Oxy.cam	5	5	5			5	5	5					5	5				5	5			5	5	5	5
Pol.sen		5	5		5		5		5		5	5	5	5	5			5	5					5	
Pot.arg										5															
Sis.mon													5								5		5		
Sol.rig											5														
Sol.spa		5	5	5	5	5					5				5	5		5	5		5	5	5	5	5
Sym.lae	5	5	5	5			5	5	5	5	5	5	5	5	5	5	5	5	5				5	5	
Tha.ven	5	5	5	5	5		5	5	5	5	5	5	5	15	5	5	5	5	5		5		5	5	5
Vic.ame	5	5			5	5	5		5		5	5	5	5			5	5		5	5	5	5	5	5
Vio.adu	5	5		5	5	5	5	5	5		5	5		5	5		5			5	5	5		5	
Ziz.apt										5			5	5					5						5
Zyg.ele										5															
Ame.aln																			5	5			5	5	
Arc.uva			5	35	45		5	15	5	15	15	15	15	5	35				15	15	5			25	
Pin.ban											5		15		5		5	15							
Pop.bal		5																				5			
Pop.tre		15	5			5		35			5	5	5	5		15	55	15	5		5		15	15	15
Ros.aci	5		5	5	5	5	5	5				5	5				5	5			5	5	5	5	5
Sym.occ	5	5		5			5																5		
litter	5	5	15	5	5	5	5	5	5	25	5	5	5	5	5	5	15	5	5	5	15	5	5	5	15
bareground		5	5	5		15	5			5	5	5		5		35	5	5			5	5	5	5	

1995.1271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		5	5	5	5		5		5	5	5	5	5	5	5		5		5			15	5	5	5
Cal.spp							5			5															
Car.spp	5	5	5		5	5	5	5	5	15		5			5		5	5	5	15	5				5
Ely.spp	5	5	5	5	15	5	5	5	5	5	15	5	15	15	5		5	5	5	5	5	5	5	15	15
Ely.vil						5								5											
Fes.hal	15	35	45	5	25	5	15	5	5	5	15	35	5	15	15		15	5	5		15	5	15	15	25
Hes.spp														5	5		5		5		5		5		
Koe.mac	5					5	5	5	5					5			5	5	5						
Ory.spp			5											5											
Poa.spp						5			5												5				
Sch.pur	5									5								5			5				
Ach.mil	5	5	5	5			5	5	5	5	5	5	5			5	5	5	5	5	5	5	5	5	5
Aga.foe		5		5		5	5							5			5	5	5						
Ago.gla	5	5			15	5	5					5				5		5	5		5		15		5
All.spp																					5				
And.sep								5																	
Ane.cyl									5	5															
Ane.mul	5	5		5					5		15				5							5			
Ant.spp				5																					
Art.cam				5																			5		
Art.lud											5	5		5		5									
Cam.rot	5	5			5						5	5				5	5	5	5	5	5				

Com.pal	5	5	5	5			5	5			5	5	5		5			5	5		5	5	15	5	
Cre.tec		5			5														5		5				
Eri.spp											5							5						5	
Fra.vir	5	5	5				5	5	5					5						5					
Gal.bor	25	25	15	15	15	5	5	5	5	5	25	25	15	5		5	5		5		5	15	5	15	25
Hed.alp		5		5			5																		
Heu.ric		5					5																	5	
Hie.spp				5									5												
Lat.och			5					5		5			5				5	5	5	5				5	
Lit.can						5							5					5							
Mai.ste	5		15							5			5	5			5	5		5				5	
Ort.lut									5									5							
Oxy.cam																					5				15
Pol.sen																		5							
Pot.arg	5						5			5	5		5				5								
Sel.den																						5			
Sis.mon			5														5							5	
Sol.can	5				5	5								5									5	5	
Sol.spa	15	5	5	5	5	5		5	5	5	5	15	5		5	5	5	5	5	5	5	5	15	15	15
Ste.lon																	5		5						
Sym.lae		5	5	5			5		5	5	5		5			5	5	5	5	15	5			5	
Tha.ven	5	5	5	5	5	5	5	5	5	5	5		5	5	5		5		5	5	5	5	5	5	
Vic.ame	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5		5			5	5	5		5
Vio.adu		5		5		5	5	5	5	5		5				5	5		5			5	5		5
Ziz.apt														15											
Zyg.ele			5																						
Ame.aln	5		25		15		5	5					35	25										15	15
Arc.uva																		15							
Pop.tre																								5	
Ros.aci		5		5			5		5		5		5			15	5			5	5			15	
Sym.occ				5		15		5		15			5			5			5	35	5	5			
litter		15	5	5	5	5	5	5	5	5		15	5	5	5	15	5	5	5	5	5	5	5	15	
bareground	15	5		5				5	5	5	35	5									5	5	15		5

1995.1272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5	5			5	5	5									5	5		5		5			5	
Bro.spp																		5							
Cal.spp						5	5																		
Car.spp			5				5	5	5	5		5				5	5	5	5	5	5			5	5
Dan.int						5																			
Ely.spp	5	5	5	5	15	5	5	5	5	5	15	15	25	15	15	5	5	5	5	5	5	75	15	25	5
Ely.vil			5																5	5					25
Fes.hal	35	35	5	5	25	5	5	5	5		15	25	5	5	15	5	15	5		5	15	5	35	5	15
Hes.spp	5	15								5		5					5				5		25		
Koe.mac							5		5						5	5	5	5							
Ory.spp												15									5				
Poa.spp					5						5						5							5	5
Sch.pur				25				5				5			5		5								
Ach.mil	5	5	5	5	5	5	5	5	5		5	5	5	5	5		5		5		5	5		5	
Aga.foe			5			5																5		15	
Ago.gla	5	5	5	5							5	5	5		15			5	5		5			15	5
All.spp																	5						5		
Ane.cyl						5			5																
Ane.mul											5	15						5			5				
Ant.spp															5										
Art.lud																						5		5	
Cam.rot		5			5		5	5	5	5		5	5	5		5		5	5	5	5		5	5	
Com.pal	15	5	5				5	5		5	5	5					5	5	5	5	5	5	5		
Cre.tec	5													5	15					5					
Epi.ang						5																			
Eri.spp					5	5			5	5	15	5				5				5	5	5		5	
Fra.vir			5	5				5	5				5	5		5				5					
Gal.bor	15	25	15	5	15	5	5	5	5	5	15	15	5	15	15	5	5	5	5	5	25	15	25		5
Hed.alp							5	5	5				5		15				5	5					
Het.vil								5																	
Heu.ric	5										15				5				5						
Lat.och			5			5	5	5	5	5	15		5	5		5		5	5	5					
Lil.phi																				5					
Lit.can								5	5																
Mai.ste				5	5		5		5				5	15											

Oxy.cam															15				5		15	5	5		5
Pol.sen															5				5	5			5	5	
Pot.arg		5									5														
Sil.dru																5									
Sol.can							5									15									
Sol.mis													5												
Sol.spa	5	5	5		15	5		5	5	5	15	15			15	5	5	5	5	5	15		5	25	
Sym.lae	15	5	5	5	15	5	5	5	5		15		5	5	5	5	5	5	5	5	15	5		5	
Tha.ven	5		15		15	5	5	5	5	5		5		15	5	5	5	5		5	5	5	5	5	15
Vic.ame	15	5		5	5	5	5	5	5			5	5		5	5	5	5	5	5	5	5	15	5	5
Vio.adu				5			5	5	5		5	5	5			5		5	5	5			5	5	
Ame.aln	5				5	5	15	15																	
Arc.uva			35	15		5	25	5	15	35			75	55	25			5		35	15				
Pop.bal																									5
Pop.tre	15		5	25			15	5	5				25	25		5	5		5	5					15
Ros.aci		15		5	5	5	5	5	5	5	5	15	5	5	5	5	5		5	5	5	5	15	5	5
Sym.occ	5			15	15	5	5	5	5	5	15				5		5	5				5			
litter	5	5		5	5	5	5	5	5	5		5	5		5	5	5	15	15	5		5			5
rock												5													
bareground	5	15	5			15	5		5	5	25	5		15			5	5			25	5	5	15	

1995.1281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5		35		5	
Cal.spp		5	5													5									
Car.spp	5	5		5			5		5	15			5	5					5					5	
Dan.int												5													
Ely.spp	5	5	5	15	5	5	5	5	5	5	5	5	25	5	5		5	15	5	5	15	35	5	15	15
Ely.vil		5	5		5		5	5	5					15	5					5					
Fes.hal	25	15	15	5	25	25	15	35	25	25	35	25	5	25	5	25	25	35	25	35	15	15	25	25	25
Fes.sax				5	5																				
Hes.spp								15		5						25	35	15	5	5	5				
Koe.mac							5																		
Ory.spp																						5		5	
Sch.pur												5													
Ach.mil	5		5	5	5	5		5	5	5		5	5	5			15	5		5	5	5	5	5	5
Ago.gla							5			5	5		5			5	5		15						15
Ane.mul			5	5	5				5	5		5													
Art.lud								5	5		15				5		5								
Cam.rot		5					5				5				5	5	5								5
Com.pal		5		5	5								5	5							5		15		
Cre.tec									5						5	5		5				5			
Eri.spp		5					5	15							5	5	5		5			5			
Fra.vir	5	5	5	5				5																	
Gal.bor	15	15	5	15	15	15	15	5	5	15	15	25	5	25	15	25	5	25	25	15	15	5		5	15
Hed.alp				5									5							5		5	5		
Lat.och		5	5									15											15		
Lit.can																						5			
Mai.ste			5	5	15			5					5												
Oxy.cam								5	15											15			15		
Pol.sen		5			5												5		5	5		5	5	5	
Sis.mon	15		15																5			5			
Sol.spa	25	25	15	5	25	5	25	5	25	25	15	5	5	15	15			5	15	5		5	15	25	
Sym.lae	5		25		15	15		5		5		5	5	5	5			15	5				5	5	
Tha.ven	5	15	15	5	5	15	15	5	15	15	5	5	5	5	5		15	5	25	15		5	5	5	5
Vic.ame	5	5			5	5	5			5	5		5			15	15			5	5	5	5	5	5
Vio.adu	5		5	5	5					5	5						5	5		5		5			5
Ame.aln						25			15																25
Arc.uva													15		65						35				
Pop.bal	15										5					15									
Pop.tre																						35			35
Ros.aci	15			5	5	5	5				5	5	5	5				25	15		5	5			
Sym.occ					15	5	5	15				25	5			15					5				
litter	15	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5
bareground	5	5	5	5	5	25	15	5	5	5	15	5	5	5	15			5	5	15		5	5	15	

1995.1282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca							5																	5	
Bro.spp											5														

Cal.spp								5															5		
Car.spp				5	5					5	5			5		5		5		5	15	15	5	5	5
Dan.int																		5							
Ely.spp	5	5	5	5	5	5	5	5	5	5	15	5		5		5	5	15	5	5	5	15	5		5
Ely.vil			5	5	5	5	15	5	15	15	5	5	15	5	15	5	5		5				5		
Fes.hal	15	5	5			5	5		5	5	5					5		5		5	25	5	15	5	5
Fes.sax					5																				
Koe.mac			5		5					5									5		5			5	5
Poa.spp								5				5		5	5		5								
Sch.pur						5																			
Ach.mil		5		5	5	5	5	5	5		5	5	5	5		5	5	5	5	5	5		5	5	5
Aga.foe						5															5				
Ago.gla			5		5			5																	
Ane.can																						5			
Ane.cyl					5											5									
Ane.mul												5		5		5			5		5	5	5		
Ant.spp					5																				
Cam.rot						5	5	15				5					5		5	5	5	5	5	5	5
Com.pal	5	5			5	5		5	5		5									5	5	5		5	5
Cre.tec					5			5					5												
Epi.ang									5																
Eri.spp					5													5			5		5	5	
Fra.vir			5	5		5		5	5		5	5				5			5	5	5	5	5	5	
Gal.bor	15	15	15	5	15		5		5	5	5	5	5	5	5	5	5	5	5	15		5	5	5	
Hed.alp					5		5						5					5							5
Heu.ric									5			5				5									
Lat.och		5	5	5		5		5	5	5	5	5		5	5		5		5	5					
Lit.can							5	5					5												
Mai.can				5																					
Mai.ste						5		5			5							5	5	5		5			5
Ort.lut																5							5		
Oxy.cam					5											5				5				5	
Pol.sen		5	5	5	5			5		5									5		5		5	5	5
Pot.arg			5																						
Sis.mon					5											5		5							5
Sol.can									5	5			5	5	5				5						
Sol.spa					5	5		5		5	5	5				5	5	5	5		5	15	5	15	5
Ste.lon																			5						
Sym.lae		5	15			5	5	5	5	5	5		5		5	5	5			5			5		5
Tar.off										5	5														
Tha.ven		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			5	15	5	5	5
Vic.ame	5	5	15		5	5	5	5	5	5		5		5	5		5		5	5	5	5	5	5	5
Vio.adu		5	5		5			5	5	5	5	5		5		5	5	5	5		5		5	5	5
Ame.aln			15		5	5	15				5	5	5	15	15			5				5	15	5	5
Arc.uva	35	15		65		35	5	15	5		5	5		25			5		5	75					
Pop.bal																5							5		
Pop.tre		35	15		15	5				5	25		95		35		45		15				5	5	
Ros.aci	5	5	5	5		5	5	5		5	5	5	5	5	15	5	15	5	5	5		5		5	
She.can														5											
Sym.occ	5							5	5	5		5	15			15	15	5	5	5	5	5	5	5	15
litter	5	5	15	75	5	5	15	15	15	25	15	35	15	25	15	25	15	35	15	5	15	5	15	15	15
bareground		5			5	5		5		5						5		5	5		5	15	5	5	5

1995.2112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca																		5							
Bro.spp			5				5					5	5	5		5	5		5	5	5	5	5		
Car.spp	5	5	5	5	15	5		15	15	5	15	5				5	5	15	5		25		25	5	
Ely.spp	5			5	5	5			5	5		15	25	15	5			5	5	5		5	5	5	15
Ely.vil		5		25						5			5									55			
Fes.hal		5			15	15		15	5		5	15		5	25	45	5		5	15	5	5		45	15
Hes.spp																								5	
Koe.mac															5				5					5	
Ory.spp							5				5	5			5		5							5	
Poa.spp														5											
Sch.pur	5					5	5					5				5									
Ach.mil					5	5			5	5	5	5		5	5			5	5	5	5	5		5	5
Aga.foe				5	5				5																5
Ago.gla																5									
Cam.rot					5					5				5	5									5	5
Che.alb																								5	

Com.pal	5						5			5					5										5
Epi.ang	5	5	25	5	35	5	5	5	5		5	5	5	5		5	5	5			25	15	15		5
Fra.vir	5		5			5	5	5			5	5		5	5				5						
Gal.bor	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5
Geu.tri																	5								
Hed.alp			15								5							5							
Heu.ric		5	5				5	5																	
Lat.och		5			5		5	5	5	5	5	5	5	5	5	5	5	15	5	5		5		5	5
Mai.ste	5				5	5	5	5	5		5		5	5	5	5	5			5	15	5	25	5	
Pot.arg					5																				
Sis.mon	15	85				5	15	85		5				35	5	65	15	55	5	35	35		35		15
Sol.can						5				5	5			5	5		5	5	5					5	
Sol.mis				5																					
Sol.spa															5				5						
Sym.cil																		5		5				5	5
Sym.lae				5			5		5	5					5		5	5	5	5		5			5
Tar.off								5																	5
Tha.ven	5	5	5		5				5			5		5	5	5	5		5	5	5	5	5		5
Vic.ame	5	5			5	5	5		5		5			5		5	5	5	5	5	5	5	5	5	5
Vio.adu	5			5			5		5			5					5		5					5	
Arc.uva							15																		
Lon.dio		5																							
Pop.bal			45																					5	
Pop.tre				5									95									75			
Ros.aci	5	5	5	15		15	5	5	5	5	15	5	25	5	5	5	15	5		5	5	5	5	5	
litter	35	35	25	35	15	15	15	25	15	15	15	15	35	15	15	25	15	5	15	5	15	35	15	5	5
bareground														5					15					5	

1995.2171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca	5	5				5		5	5		5			5				5			5		5		
Bro.spp																									5
Car.spp						5	5	5	5		5				5	5	5		5				5		
Ely.spp	5	5	5	15	5	5	5	5	5	5	5	5	25	5	5	5	5	5	5	5	5	5	15	5	5
Ely.vil							5										5	5	5	5				5	5
Fes.hal	25	15	35	55	35	15	25	15	35	25	25	25	55	15	35	35	35	55	25	15	15	15	5	5	5
Hes.spp																		5							
Koe.mac	5	5	5		5		5	5	5					5	5					5	5		5	5	
Muh.rac													5												
Ory.spp	5		5							5						5							5	5	
Poa.spp																							5		
Ach.mil	5	5		5	5	5		5	5	5	5		5			5		5	5	5		5	5	5	
Aga.foe		5					5	5					5												
Ago.gla	5	5	5		5	15	5	5	25	5	5	5		5	5		5	15	15	5	5			5	5
And.sep			5																						
Ane.can				5																					
Ane.cyl	5		5		5			5	5			5		5	5	15									
Ane.mul	5	5									5					5		5					5	5	
Ant.spp								15	5		5				25		5								
Art.lud									5												5		5		
Cam.rot	5				5					5								5		5	5	5	5		5
Com.pal	5																5	5	5	5		5	15	5	
Cre.tec					5	5			5	5	5				5		5			5				5	
Eri.spp	5		5	5		5			5		5							5	5				5	5	
Fra.vir	15				5			5	5	5	5		5		5	5			5	5				5	
Gal.bor	25	5	5	15	5	5	5	5	5	5	5	15	5	5	5	15	15	15	5	5	5	15	5	5	
Hed.alp	5		5		5			5	5	5	5	5		5			5		5	5				5	5
Heu.ric					5												5		5						
Lat.och		5	5	5			5				5	5	5		5				5	5		5	5	5	5
Lit.can			5		5			5			5			5											
Lyc.spp						5																			
Mai.ste	5				5		5				5			5			5			5		5		5	
Ort.lut						5		5																	
Oxy.cam						5										5	5							5	5
Pol.sen	15	5	5	5			5	5		5					5		5								5
Pot.arg		5		5								5													
Sis.mon															5					5				5	5
Sol.can																						5			
Sol.spa	5	15		15	5	15	5		5	5	15	5	5	5	5	15	5	5	5	5	5	5	15	5	5
Ste.lon													5												
Sym.cil																							5		

Sym.lae	15	5		5	5	5	5	5		5	5		5	5		15	15	15	5	5						
Tha.ven	5	5	5	5			5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Vic.ame	5	5	5	5	5				5	5		5	5	5	5	5	5	5	5		5		5			5
Vio.adu	5	5	5	5				5		5	5	5		5	5	5				5		5		5	5	
Ame.aln	5	5				5	5		15	15		15			5	5	5	5	35			25				
Arc.uva																			5							5
Pin.ban															5											5
Ros.aci	5	5				5	5		5		15	5	15	15	5	15	5				15		5	5		
Sal.beb																										15
Sym.occ		5	5	15	5		5					5	15	5						5	5	5	5			
litter	5	5	5	5	5		5	5	5	15		15	5	5	5	5	15	5	5	5	5	5	5	15	5	
bareground	5	5	15			5					5				15	5				5	15			5	5	

1995.2172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca																5		5			5		5	5	5
Cal.spp		5																							
Car.spp	5	5			5	5			5			5				5	5	5	5				5		
Ely.spp	25	5	5	5		15	5	5	5		15	25	5			5	5	15	15	5	5	5	15	15	15
Ely.vil		15	15		5	5	15	15	5		5			25	25				5	5	5			5	5
Fes.hal		5					5									5	5				15	15	15	15	25
Hie.odo					25																				
Koe.mac	5																								
Poa.spp																						5			
Sch.pur	5															5	5	5							
Ach.mil	5		5			5	5		5		5		5		5	5	5	5	5		5	5	5	15	5
Aga.foe		5																							
Ago.gla	15	5				5	5				15	15					5	5			5		15	15	15
Ame.rot								5	5																
Ane.cyl												5		5		5					5				
Ane.mul																5	5	5				5	5	5	
Ant.spp																									15
Art.lud																									5
Ast.lax													5												
Cam.rot	5							5					5			5					5				
Com.pal																							5		
Cre.tec							5										5				5			5	
Epi.ang					5																				
Eri.spp																5	5						5		5
Fra.vir	5	5	15	5	25	5	5	5	5		5	5	5		5	5		5	5	15	5	5	5		
Gal.bor	5	15	15	5	5	5	5	5	15		5	15	5	5	5	15	5	5	5	5	15	5	25	15	15
Hed.alp			15	5		15			5		5	5		5							5				
Heu.ric			5		15		5																5		
Lat.och	5	5	5	5	15	5					5		5	15	5	5		5	5	5	5	5	5	5	5
Lil.phi																					5				
Lit.can																5									
Mai.ste																			5				5		
Ort.lut																						5			
Oxy.cam												15				5								5	
Pol.sen							5				5					5							5		
Pot.arg																			5	5					
Pyr.asa				5					5						5										
Sis.mon	25	35			35	15	5		5		35	35		35	35			5	5	55		5			
Sol.can				5					5					15	5					5					
Sol.spa	15					5		5								15	5	5	5		5	5	15	25	25
Sym.cil				5				5				5			5										
Sym.lae	5	15		5	15		5	5			5	5	5	5		5	5	5	5	5	5	15	5	15	5
Tar.off																				5					
Tha.ven	5	5	5			5	5	5	5		5	5	5	25	5			5	5	5			5		5
Vic.ame	5	5		5		5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5		5	5
Vio.adu		5		5	5		5	5	5				5	5	5	5	5		5						5
Ame.aln	15		5					5	5		5		5		5						25		5		15
Arc.uva				5	5	5	5					35													
Lon.dio				5																					
Pop.bal			5																						
Pop.tre				25									5												
Rib.oxy			5																						
Ros.aci		15	5	25	15		5	5	5			5	5	5	15	5	15	15	15	5	15	5	15	15	15
Sal.beb			15		25																				
She.can			15																						
Sym.occ						15		5								5	5		5			5			

litter	15	15	25	35	35	5	5	15	5		15	15	15		5	5	5	5	5	15		5			
rock																								25	
bareground			15											15		5	5	5	5		5		15	5	5

1995.2181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				5									5												
Agr.sca				5								5	5				5						5		
Cal.spp																		5							
Car.spp						5					15	5			5										5
Dan.int				25	5											5					15		15		
Ely.spp	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5
Ely.vil	15	15	5		15	5	5	15	15			15	5	5	5		5	5	5	15		15		5	15
Fes.hal	25	15	5	5	25	25	5	25	25	35	25	35	5	5	35	45	15	15	15	35	25	5	35	15	25
Fes.sax											5											5			
Hes.spp																25		15			15				
Ory.spp									5			5	5				5		5				25		
Poa.spp				5	5								5									5			
Ach.mil	5	5	5	5	5	15	5	5	5	5	5		5		5	5	5	5	5			5	5	5	15
Ago.gla			5		5		5		15	15					15	5	5			5	5		5	5	5
Ane.can													5												
Ane.mul									15			15													
Ant.spp				5																					
Art.fri											15														
Art.lud				5												15		5			5			5	
Cam.rot			5		5		5		5	5			5	5	5		5			5		5	5		5
Cer.arv													5												
Com.pal			5		15	5	5	5			5	5				15						5			15
Eri.spp																		15	5						5
Gal.bor	15	5	5	5	5	5	5		15	15	25	5	5	15	15	5	15	15	5	5	25	15	25		5
Gen.aff													5												
Geu.tri				5								5					5					5			
Hed.alp		5			15			15		5		15	5	15	5			5		15		5		5	
Lat.och			5	5	5				15	5			5	5					5	5		5		5	5
Lit.can													5												
Mai.can								5																	
Mai.ste		5			5				5						5				5					5	
Oxy.cam	25			5	5	15	25				15	5							5		5				
Pol.sen								5				5											5		5
Pot.arg							5					5													
Sis.mon		45	25	5			5	5				15					15							15	
Sol.spa			5	5	15		15	5	25	25	5	5		5	25	15	15	5	15	15		5	25	5	15
Sym.lae	5	5				5		5		5	15	5	5	5	5	5	5	15	15				15		15
Tar.off																	5					5			
Tha.ven	5	5	5	5	5		5	5	5	5			5	5	5	5	5		5	5	5		5		5
Vic.ame	5	5	15	5	5	25		5					5		5	15	15	15		15	15	5		5	5
Vio.adu			5			5		5	5							5			5			5			
Arc.uva		5	15				35	5					5	55				25	15	35	35		15	35	15
Pin.ban	25																								
Pop.bal																									5
Ros.aci		5		5	5						5		5			5					5				
litter	15	5	5	5	5	15		5	5	5	15	5	5	5	5	15	5	5	15	5	5	5	15	5	5
bareground					5				5					5	5		5	5	5					5	5

1995.2182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca		5	5	5		5	5																		
Bro.spp		5		5			5	15																	
Cal.spp								15																	
Car.spp						15			5					5											
Dan.int																5									
Ely.spp	15	15	15		15	15	5	5			5		5			15					15				
Ely.vil	15									25	5	5		5	5	5	5	5	15	15	5		25	15	5
Fes.hal		25	25	15	25	35	25	5	15		25	5	5			15	5				15	35			
Hes.spp	15	5	15		15		5																		
Poa.spp								5																	
Sch.pur													5					5			5	5			
Ach.mil	5	5		5	5	5	5	5			5	5				5	5				5				
Aga.foe	5																								
Ago.gla	5	5		5												5					5				

All.spp				5																					
Ane.mul							5																		
Art.lud		5	15	15		5	5	5																	
Cam.rot	5			5			5					5		5		5	5				5				
Com.pal																5			5						
Cre.tec	5					5																			
Epi.ang													5	5	15				5			5			
Eri.spp		5																							
Fra.vir							5						5						5	15					5
Gal.bor	15	15	5	15	25	15	15	15	5	5	5	5	5			15	5	5	5	5	5	5	5	5	5
Geu.tri			15						15		15														
Hed.alp	5				5						5														
Heu.ric				5					5					15			5								5
Lat.och						5		5	5		15	5	5			15	5	15	15	5	15	5	5	5	5
Lil.phi									5																
Mai.can												5						15							
Mai.ste							5					5	5					15		15	5	5		25	15
Oxy.cam				5			25				5														
Sis.mon							15	25	35	55	25			55		25	35	55	55	35	25		55	5	45
Sol.can										15				15			15		15					25	
Sol.spa		25		5		15	25	5			25		5			15	15				5	15			
Sym.lae		15				5	5	5	15	15	5	15	5			5	5	5	5		5	5	5	5	25
Tar.off													15				15				5				
Tha.ven	5	5	15			15	5		15	5		15	25	15	5	5	5	15	25	15	5	5	5	15	15
Vic.ame		5	5	5	5				5		5			15		15	5			5	5		5	5	
Vio.adu									5	5		5	5			5						5	5	5	5
Ame.aln																						15	15		
Arc.uva	25																								
Bet.spp																				35					45
Pop.bal					5																				
Pop.tre													15									35			
Ros.aci	15			5				15	15	15			5	35	25	15		35	25	15	5	5	5		15
Sal.beb																								35	
Sym.occ			25		25			25														5			
litter	5	5	5	15	15	5	5	25	15	15	15	15	25	35	45	25	15	5	15	15	5	15	15	5	5
rock							15																		
bareground		15	15	15			5	5	5	15	5				5	5	5			5					5

1995.2212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				5																		5			
Agr.sca		5																							
Bro.spp			5	5	5		5	15						5	5		5		5				5		
Cal.spp	5					5													5						
Car.spp									5																
Ely.spp		5	5		5	5			5	5	5			5	5	5	5			5	5		5		25
Ely.vil	25	5	5	5		15	5		5	5	5	15	35	5	5	25	15	5	5	5	5	15	5	5	
Fes.hal		5	5		25	5	5		5	5	5	5		5	15	5		25	5	15	5	25	5	15	5
Ory.spp				5							5		15			5						5			5
Poa.spp	15	5	5			5	5	5									5						5		
Sch.pur			5	5		5	5			5		5			5	5	5				5	5			5
Ach.mil	5	5	5		5	5	5	5		5	5	5	5	5	5		5	5	5	5	5	5		5	5
Aga.foe								5				5													15
Ago.gla		5												5						5					
Cam.rot	5	5				5			5									5	5	5		5		5	
Com.pal			5				5	5						5		5	5				5				
Epi.ang																				5					
Eri.spp																				5					
Fra.vir	5		5		5				5		5		5	5			5	5			5		5	5	
Gal.bor	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5
Gen.aff																				5					
Geu.ale					5																				
Geu.tri							5						5									5			
Hed.alp							5														5				
Heu.ric	5	5			5	5	5				5	5		5		5					5		5		
Lat.och	5	5	5	5	5	5	15	5	5	5	5	15	15	5		15		5	5	5	5	5	5	5	
Mai.ste	5	5	5	5		5			5	5					5										
Pol.sen																					5				
Pot.arg																				5					
Pyr.asa																	5			5	5				
Sis.mon	25	35	15		5	25	35	25	35		35			15	5	15	15	5	35	5			85	25	5

Sol.can		5	5				5	5	5	5					5		5	15	5	5				5	5
Sol.spa	5										5		5						5				5		
Ste.lon	5								5													5			
Sym.cil														5	5									5	
Sym.lae	5		5		5		5			5	5		5	5	5		5	5		5	5		5	5	5
Tha.ven	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5
Vic.ame	5		5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5
Vio.adu	5	5	5		5	5	5	5				5	5	5			5			5	5	5	5		
Ziz.apt														5			5			5					
Ame.aln												5													
Arc.uva											5											15			
Bet.spp																			15				15		15
Pop.tre				15									75												
Ros.aci	15	5	5	15	5	5	5	5		5	5	5			5	5		5	5		5		5	5	5
Sal.beb																			15		85				
litter	15	15	15	25	5	25	15	15	15	15	15	15	25	5	5	15	25	5	15	15	15	15	15	5	15
bareground	5		5																						

1995.2271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																						5			
Agr.sca		5					5			5	5	5			5		5	5		5			5	5	5
Bro.spp											5														
Cal.spp																					25				
Car.spp	5	5		15			5	15		5			5			5		5		5					5
Dan.int																		15					5		5
Ely.spp	5	5	5	65	5	5	5	15	5	5	5	15	15	15	5	5	5	5	15	5	5	15	5	5	5
Ely.vil						5						15												5	
Fes.hal	5	5	35		15	35	5		25	5	35	25	25	45	5	45	25	35	35	5		15	5	5	5
Fes.sax	5							5				5													
Hes.spp	5	5	5		5	5		5		5					5	5	5		5	15					5
Koe.mac		5					5		5	5					5		5		5	5	5		5		5
Ory.spp					5								5	5							5	5			
Poa.spp								5																	
Ach.mil	5	5	5	5	5	5	5	5	5	5	5	5	5				5	5	5			5	5	5	5
Aga.foe										5	15	5	5		5						5	5	5		
Ago.gla	5			5				5	5	5				15	5	5		5				5		5	5
All.spp		5																							
Ane.cyl																5		5							
Ane.mul													5		5										
Ant.spp	25							5																	
Art.cam						5	5																		
Art.lud		5	5				5					15	5			15	15	5			5		5	5	
Cam.rot						5					5	5	5	5					5		5	5		5	
Cer.arv													5												
Com.pal	15	5	5	5	5	5	5	5	5	5	5	15	5		5	5	5	5	5	5					
Cre.tec	5					15		5					5			5			15	5		5		5	5
Eri.spp													5						5						
Fra.vir																					5				
Gal.bor	35	15	15	5	5	35	5	15	5	5	25	15	15	25	5	15	25	35	25	5	15	5	5		15
Geu.tri																						5	5		
Hed.alp															5										
Heu.ric																			5			5			
Lat.och									5	5	5		5			5						5	5		
Lil.phi								5																	
Lit.can						5															5				
Mai.ste												5								5					5
Ort.lut							5																		
Oxy.cam	5	5		5	5							5													
Pol.sen																				5			5		
Pot.arg						5		5							5										
Sis.mon																						5		5	
Sol.can																5									
Sol.spa	5	5		5			5	15		5	15		5	15			15			5		5	5	5	5
Ste.lon																							5		
Sym.lae						15	5		5	5	5	5		5	5	5		5				5			
Tha.ven		5		5	5		5	5	5	5	5	5	5	15	5	5		5	5	5	5	5	5	5	5
Vic.ame	5	5	5	5	5	5	5	5	5	5		5	5	25	5		5	5		5	5	5	5	5	5
Vio.adu					5	5	5	5			5		5	5					5					5	5
Ame.aln				5	15		5			5	5				5	15					15	5			
Arc.uva		15																							

Ros.aci		5	25	5		5	5	5	5					5	5	15			5	5	5	5	5	5	5
Sal.beb																								5	
Sym.occ		5	5	15	5		5		5					15	5				25	5	5	5			
litter		5	5	5	5	5	5	15	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5
rock	25	5										5									45				
bareground	5	5		5		5	5	5		5		5	5				15		5	5		5	5	5	5

1995.2272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				5																					
Agr.sca																						5			5
Bro.spp	5						5	5	5		5						5	5							
Cal.spp											5														
Car.spp															5					5	5	5		5	5
Dan.int					15																			5	5
Ely.spp			5	15	5				5	15				15	5					5	5	5	5	5	5
Ely.vil	5	5	5			5	5	5	15	5		5		5		5	5	5	5				5		
Fes.hal	5	5	25		5	5		5		15	5				15	5			5	15	5		15	15	5
Hes.spp																					5				
Koe.mac															5					5	5		5		5
Ory.spp					5																				
Poa.spp	5	5	5			5	5	5	5		5	5				5	5	5	5						
Sch.pur									5		5						5								
Ach.mil	5		5	5	5			5		5	5	5			5			5	5	5	5	5	5	5	
Aga.foe																	5							5	
Ago.gla					5										5									5	5
And.sep										5															
Ant.spp																					5				
Art.lud											5														
Cam.rot						5				5	5				5	5					5	5	5	5	
Com.pal		5		5	5										5	5					5	5	5	5	5
Cre.tec			5				5			5															
Epi.ang								5								5									
Eri.spp																						5		5	
Fra.vir								5	5			5				5	5								
Gal.bor	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	15
Gen.aff				5																					
Geu.tri					5																				
Hed.alp	5			5		5					5					5		5	5		5		5	5	5
Heu.ric							5													5	5	5			
Lat.och	5	5		5	5	5		5	5	5	5	5		5			5	5	5			5	5	5	5
Lit.can																				5					
Lyc.spp												5													
Lys.cil												5													
Mai.ste		5	5			5			5	5				5				5	5	5	5		5	5	5
Ort.lut																								5	
Oxy.cam				5	5										5						5	15		5	5
Pol.sen				5																					5
Pot.arg																								5	
Pyr.asa											5														
Sis.mon	5	35	25	5		25	75	15	35	5	25				5		25	35	5	15	5		15		5
Sol.can							5	15	5		5	5					5	5							
Sol.mis				5										5											
Sol.spa	5		5	5	15				5	5		5			5	5				5	5	5	5	5	5
Ste.lon						5				5					5					5					
Sym.cil				5																					
Sym.lae	5		5				5		5	5	5	5				5	5	5		5		5	15		
Tar.off									5						5										
Tha.ven	5	5	5		5	5	5	5	5	5	5	5		5		5	5	5	5				5	5	5
Vic.ame		5	5	5	5	5	5		5	5	5	5		5	5	5	5	5	5	5		5	5	5	
Vio.adu	5	5	5	5	5	5			5	5	5	5		5	5	5	5	5	5		5	5	5	5	5
Ziz.apt																					5				
Ame.aln			5			15					15			15											
Arc.uva				15					5								15								
Bet.spp									5	5						55	35	65							
Lon.dio												5													
Pop.bal										5															
Pop.tre				5										75											
Rib.oxy								5				5													
Ros.aci	15	5	5	15	5	15	15	5	15	5	5	5		5	5	5		5	15	15	15	5	15	5	5
Vac.cae								15																	

litter	25	15	5	5	5	15	25	35	15	5	15	25		25	5	15	25	25	15	5	5	5	5	5	5
bareground				15						5		5			5					5	5	15			5

1995.2281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric													5												
Agr.sca	5				5	5	5	5	5	5		5	5	5						5					
Cal.spp	15					5					15	5		15				5					5		
Car.spp			5	5				5	5	5								5	5	5		5			
Dan.int		5	5	5	5	5		5	15	5	5		5		5		5	15							
Ely.spp	15	15	5	5	15	5	5	15	5	5	5	5	15	15	5	5	5		5	5	5	5	5	5	15
Ely.vil					5	5			5							5				5					
Fes.hal		35	35	5	25	15	5	5	5	5	35	35	5	45	25	5	15	5	15	5	35	15	45	55	35
Fes.sax									5	5					5			5		5					
Hel.hoo			5		15				5																
Hes.spp			5		5									5					5	5				25	15
Koe.mac	5						5	5	5	5				5				5		5			5		
Ory.spp		5	5			5	5			15						5						5		5	
Poa.spp								15					5												
Ach.mil	5	5	5	5	5			5	5	5	5		5	5	5		5	5	5	5			5	5	
Aga.foe		25	5			5	5	5			5	5	5			5	5	5			5	5	15		
Ago.gla	15	5	5			5			5	5		5	5		15	5		5	15	5				5	5
And.sep									5																
Ane.cyl	15							5													5				
Art.lud																	5					5			
Cam.rot			5	5	5	5	5		5	5	5		5	5	5		5	5		5	5	5	5	5	
Com.pal	5	5	5	5	5	5	5	5					5		5	5	5	15	5	5		5	5	15	15
Cre.tec	5							5		5															
Epi.ang							5										5								
Eri.spp				5	5		5	5		5							5				5		5		5
Fra.vir																5									
Gal.bor	5	15		15	25	5	5	5	5	5	5	5	5	5	25	5		5	5	5	5	15		15	15
Geu.tri										5												5			
Hed.alp	5	5				5					5	15					5		5			5	5		
Heu.ric		5								5													5		
Lat.och	5	5	5		5	5	5	5			5		5	5		5	5				5	5	5		
Lil.phi		5																							
Lit.can	5		5																						
Mai.ste	15					5				5		5		15	5				5					5	5
Ort.lut					5													5			5				
Oxy.cam					5					5					5					5					
Pol.sen		15				5					5														
Pot.arg	5	15				5																			
Sis.mon	25					5					25	15				25					35				
Sol.can			5		5											5	5				15				
Sol.spa	15	15	5	5	25	5	15	5	15	15	5	15	5	5	15		15	15	5	15	5	5	15	5	15
Ste.lon								5		5			5					5							
Sym.lae	5	5		5		5	5	5	5		15			15	5	5	5	5			25	5	5		
Tha.ven	15	15	15	5	5	5	5	5		5	5		5	5	5	5	5	5	5	5	5	5	5		5
Vic.ame	5		5	5		5	5				5	5	5		5	5		5	5	5		5	5	5	5
Vio.adu	5		5	5		5	5						5		5	5		5	5	5		5	5		5
Ziz.apt											15		5										5		
Ame.aln																				5					
Arc.uva																5									
Bet.spp												5													
Ros.aci	15					5								5	5	5		5	5	5	15	15	15	15	5
Sal.beb								5																	
Sym.occ					5																				
litter	5	5	15	15	5	5	5	5	5	5	5	5	5	15	5	15	15	5	5	5	5	15	15	15	5
bareground	5	5	5	5	5		15	5	5	5	5	5	15		5		5	5	5	5	15	15	5	5	5

1995.2282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric													5									5			
Agr.sca															5						5			5	
Bro.spp				5									5												
Cal.spp																								5	
Dan.int																				5				5	15
Ely.spp					15					5	5		5		5			5			15	15	5	5	5
Ely.vil	5	5	5		5	15	5	5	5	5	5	15	5	5		5	25	5	5	5					

Fes.hal	5			5	5					5	5				5	5		5		15	25	25	25	15	45
Hel.hoo																				5					
Koe.mac																					5	5			
Ory.spp							5		5									5		15					5
Poa.spp							5	5	5							5	15		5						
Sch.pur				5																					
Ach.mil					5		5			5		5	5	5	5		5	5			15	5		25	5
Aga.foe			5							5					15						5		25		5
Ago.gla																						5	5	5	
Cam.rot				5		5														5		5		5	
Cer.arv																	5								
Cir.arv				5																					
Cir.fol																									5
Com.pal																				5	5	5		5	5
Cre.tec	5																	5				5			
Epi.ang														5											
Eri.spp																						5			
Fra.vir	25	15	5	5		5	5	5	5	5		5	5	25	25			5	5						
Gal.bor		5		5	5				5		5	5	5		25	5	5	5	5	5	5	5	5	5	15
Hed.alp		5			15			5												5			5	15	5
Heu.ric								5			5														
Lat.och				5	15		5		5	5	5	5	5		15	5	5	5		5	15	5	15	5	5
Lit.can										5								5							
Mai.ste		15									15	5				5	5	5	5		5		5	15	
Pol.sen																					5				
Pot.arg	5								5	5					5	5	5								
Pyr.asa		5						5						5	5										
Sis.mon	35	45	25			5	15	55	55	35	55	45		85	65	85	85	55	75	5	35		5	15	
Sol.can	15		5			5				5	15					5			5				25		
Sol.mis				5									15												
Sol.spa				5									5				5	5		5	25	5		15	15
Ste.lon																				5		5			
Sym.cil									5																
Sym.lae	15	15		5	5		5	5		5	5	15	5	5	15			5	5				15		5
Tha.ven		5	15	5		15	5	5	15	5	15	15	5	5	5	5	5	5	5		5	5	5		5
Vic.ame	15			5		5	5		5	5	5	5	5		5	5	5	5				5	15	5	
Vio.adu				5			5	5	5	5				5		5		5	5			5	5	5	
Ziz.apt			5		5			5																	
Ame.aln			15			25					15					15		15	15						
Arc.uva		5			35				5	5			15		35										
Bet.spp			25		5		25	15	5		15														
Pop.tre				35									25												
Ros.aci	15	25		5	15	5	5	5	5	5		25			5	5	5			5	5		15	15	
Sal.beb			25					15						15				5	15						
litter	15	15	5	15	5	5	15		25	15	25	5	25		5	15	15	15	35	5	5	5	5		15
bareground			5	15		5				5					15			5			5	5	5	25	

1995.3111	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric													5												
Bro.spp					5																				
Cal.spp											5										5				
Car.spp	5	5				5	5			5		5													
Ely.spp	15	5	5			5	15	5		5	5	15	25	5	5		5	5	5	5	5	15	5	5	25
Ely.vil	5	5	5	25	5		5	5	5	5			5	5	5		5	5	5	5	5		5	15	5
Fes.hal	5	15	25			15	5	5		5	15	5	5	5	5		15	5	15	5	15	25	25	5	
Hes.spp						5																			
Hie.odo				5																					
Koe.mac			5			5					5						5	5					5		
Ory.spp											5										5				
Poa.spp					5		5	5	5	5			5												
Sch.pur																					5	5			
Ach.mil	5	5		5	5	5	5	5		5	5	5	5		5		5	5	5	5	5	5	5		5
Ago.gla		5	5			5				5		5										5	5	5	
Ane.cyl	5																								
Cam.rot	5					5	5						5								5		5		5
Com.pal	5		5	5		5	5			5	5	5	5				5		5	5			5		
Cre.tec		5	5										5				5					5			5
Epi.ang								5		5			5	5											
Fra.vir	5	5	5	5	5	5		5		5	5	5	5	5					5		5		5		5
Gal.bor	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5		5	5		5	5	5

Hed.alp	5		5				5	5			5	5	5	5			5			5	5		5		5
Heu.ric						5		5																	
Lat.och	5	5	5	5		5	5	5			5	5	5		5		5	5	5		5	5	5	5	5
Lil.phi			5								5									5					5
Lit.can	5	5	5			5	5	5		5	5	5							5		5				
Mai.can				5	5			5	5	5				5	5					5					
Mai.ste	5	5				5	5																		
Pol.sen	5									5							5							5	
Pyr.asa		5	5	5	5			5	5	5				5	5										
Sol.can	5		5		5	15	5	5		5	5			5	5		5	5	5					5	5
Sol.spa	5	5				5	5					5					5	5	5	5	5	5	5	5	
Sym.cil					5					5															
Sym.lae	5	5	5	5			5	5		5	5	5	5	5	5		15	5		5		5	15	15	
Tar.off										5									5	5					
Tha.ven	5	5	5	15	5					5	5		5	5	5		5	5			5	5	5		5
Vic.ame	5		5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5
Vio.adu	5	5	5	5		5		5		5	5	5	5				5	5	5	5	5	5	5	5	5
Ziz.apt				5			5				5							5	5						
Ame.aln	5	5	15	25	5	5	15	5	5			15	5		15					15		15	5	5	5
Arc.uva	25	15	5				5	5			25	25	25				35	35	15		15	15	25	15	5
Bet.spp				55	45		5	15	65	5		15		35	45			15		75		5			35
Lon.dio																						5			
Pop.bal												5		5										5	
Pop.tre	5		5			5	5	15		5		15					5	15			15		5	5	
Ros.aci	5	5	5	15	5	5			5	5	5			5	5			5	5	5	5				
Sal.beb					15									35	25										25
Sym.occ				5	5				15																
Vac.cae			5	5	5				5	5															
litter	5	5	5	25	25	5	5	15	25	15	5	5	5	25	15		5	5	5	35	5	15	5	5	25
bareground	5	5	5		5	5	5			5	5	5							25		5				

1995.3112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Agr.sca																			5						
Bro.spp				15															5		5			5	5
Car.spp													5												
Ely.spp								5		5	5		15	15	5			5	15	5	5	5		5	5
Ely.vil	5	5	5	5		5	5	5	15	5	15	5	5		5	15	15	5		5	5	5		5	5
Fes.hal			5	5					5	15			5	15	25			5	25	35	25	5			5
Koe.mac														5				5							
Poa.spp	5					5	5	5	5			5				5	5						5	5	5
Sch.pur			5	5															5					5	
Ach.mil			5	5		5	5		5	5			5	5	5		5		5	5	5	5		5	5
Aga.foe																						5			
Ago.gla															5										
And.sep							5																		
Cam.rot													5	5	5				5	5					
Cir.fol														5											
Com.pal			5												5					5					
Epi.ang		5							5			5	5				5								
Fra.vir	5		5	5		5	5	5	5	5	5		5	5			5	5	5	5	5	5	5	5	5
Gal.bor			5	5		5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5
Geu.ale			5																						
Hed.alp											5				5					5	5				
Heu.ric									5				5						5						
Lat.och	5	5	5	5		5		5	5	5		5	5	5	5	5			5	5	5	5	5	5	5
Lyc.spp																								5	
Mai.can	5	5					5		5												5				
Mai.ste				5					5			5								5					
Pol.sen														5						5					
Pot.arg															5				5						
Pyr.asa	5	5				5	5		5							5	5					5	5		
Sol.can	5		15			5				5	5			5		5	5	5	5		5			5	5
Sol.mis																						5			
Sol.spa				5															5			5			
Ste.lon				5									5									5			
Sym.lae				15		5		5		5	5		15	5	5			15	5	5	5	5		5	5
Tar.off													5					5							
Tha.ven				5			5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5
Vic.ame	5	5	5			5	5	5	5	5	5	5		5	5	5	5	5	5		5	5	5	5	5
Vio.adu			5					5	5	5	5				5	5	5	5		5	5	5	5	5	5

Ziz.apt														5	5	5					5			5	5
Ame.aln	15	15				15	5			5		5	5			5	5	5			5	5	5	15	
Arc.uva															5						15				
Bet.spp	5	15		85				55	75	5		35				45		15				35	35	25	
Lon.dio				5																5			5		5
Pop.bal																				5					
Pop.tre	75	65	45	15		25	55	25	15	5		35	15		35	35			25	5		25			5
Ros.aci	5	5	5			5	15	5	15	15	15	5	5	5	5	15	5	5	5	5	5	5	15		5
Sal.beb	5							25		25		15					55	15					35	5	15
Sym.occ	5					5	5	5			5	5				5	5	5			5	5	5		5
Vac.cae	5	5				5		5					5	5		5		5	5			5			5
litter	25	35	25	15		25	35	25	35	5	15	25	5	5	5	15	25	5	5	5	15	25	25	15	15
bareground								5			15		15												

1995.3211	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp										5				5								5			
Cal.spp																									5
Ely.spp	5	15	5	5	5	5	5	5	5	5	5	5	15	5	5		25	15	5	15	5			5	5
Ely.vil	5	5		5	5	5	5	5	5			5	15			15	5	5	5		5	15	15	5	
Fes.hal	5		25	55	15	5	5	25	5		5	5	5	25	5		5	15		5	15	5		5	15
Hie.odo																						5			
Koe.mac															5										5
Poa.spp						5				5					5	5	5		5						
Sch.pur											5									5					
Ach.mil	5	5	5			5		5				5	5	5	5		5	5					5	5	5
Ago.gla			5	5	5		5	5						5	5										
Ane.mul																						5			
Cam.rot		5		5	5	5						5		5								5			5
Com.pal			5					5						5							5				5
Cre.tec	5		5					5											5			5	5		
Epi.ang									5	5	5					5			5						
Fra.vir	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5
Gal.bor		5	5	5	5		5	5	5	5	5		5	5	5		5	5	5	5	5	5	5	5	15
Geu.tri				5																					
Hed.alp	5		5		5	5		5	5		5				5	5	5	5		5					5
Lat.och	5	5	5	5	5	5	5	5	5	5	5		5	5	5		5	5	5	5	5	5	5	5	5
Mai.can		5	5				5			5		5						5			5	5			
Mai.ste			5	5	5			5																	
Pol.sen																	5				5				
Pot.arg					5																				
Pyr.asa					5	5		5				5		5	5	5	5	5	5		5	5	5	5	
Sis.mon														5											
Sol.can	5	5	5			5	5	5	5			5		5	5	5	5		5		5		5	5	
Sol.mis																						5			
Sol.spa					5		5						5		5							5	5		5
Sym.lae	5	5	5	15	5	5	5	5	5	5	5	5	15	5	5		5			5	5		5	5	5
Tar.off																					5				
Tha.ven	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5		5		5	5
Vic.ame	5	5		15	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5		5	5	5	
Vio.adu	5	5	5	5	5	5		5	5	5	5		5	5	5		5		5	5		5			5
Ziz.apt	5	5				5					5				5										5
Zyg.ele		5																							
Ame.aln	5		5	15		15	15	5			5	15			5	5		5	5	15	5	5	5		
Arc.uva	5					15	5		5								15								5
Bet.spp	15	15				5	35		25	55	5	35	25		5	25		35	85	5	25	95	55	25	
Lon.dio																5									
Pop.bal								5																	
Pop.tre			5	45		5		25	5					5	5	5	5			15				15	5
Ros.aci	5		5			5		5	5	5			5	5	5	15		5		5	5				
Sal.beb					15			5	5		15		45			25				5					
Sym.occ										5	5	5	5		5	5		5	5			15			5
Vac.cae		5					5				5					5	5	15	5	5	5	5			
litter	25	25	25	25	25	5	15	5	5	15	25	15	25	25	15	15	15	15	25	15	15	25	25	25	5
bareground									5	5									5						15

1995.3212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric													5												
Bro.spp					5																				

Cal.spp											5										5				
Car.spp	5	5				5	5			5		5													
Ely.spp	15	5	5			5	15	5		5	5	15	25	5	5		5	5	5	5	5	15	5	5	25
Ely.vil	5	5	5	25	5		5	5	5	5			5	5	5		5	5	5	5	5		5	15	5
Fes.hal	5	15	25			15	5	5		5	15	5	5	5	5		15	5	15	5	15	25	25	5	
Hes.spp						5																			
Hie.odo				5																					
Koe.mac			5			5					5						5	5					5		
Ory.spp											5										5				
Poa.spp					5		5	5	5	5			5												
Sch.pur																					5	5			
Ach.mil	5	5		5	5	5	5	5		5	5	5	5		5		5	5	5	5	5	5	5		5
Ago.gla		5	5			5				5		5										5	5	5	
Ane.cyl	5																								
Cam.rot	5					5	5						5								5		5		5
Com.pal	5		5	5		5	5			5	5	5	5				5		5	5			5		
Cre.tec		5	5										5				5					5			5
Epi.ang								5		5			5	5											
Fra.vir	5	5	5	5	5	5		5		5	5	5	5	5					5		5		5		5
Gal.bor	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5		5	5		5	5	5
Hed.alp	5		5				5	5			5	5	5	5			5			5	5		5		5
Heu.ric						5		5																	
Lat.och	5	5	5	5		5	5	5			5	5	5		5		5	5	5		5	5	5	5	5
Lil.phi			5								5									5					5
Lit.can	5	5	5			5	5	5		5	5	5							5		5				
Mai.can				5	5			5	5	5				5	5					5					
Mai.ste	5	5				5	5																		
Pol.sen	5									5							5							5	
Pyr.asa		5	5	5	5			5	5	5				5	5										
Sol.can	5		5		5	15	5	5		5	5			5	5		5	5	5					5	5
Sol.spa	5	5				5	5					5					5	5	5	5	5	5	5	5	
Sym.cil					5					5															
Sym.lae	5	5	5	5			5	5		5	5	5	5	5	5		15	5		5		5	15	15	
Tar.off										5									5	5					
Tha.ven	5	5	5	15	5					5	5		5	5	5		5	5			5	5	5		5
Vic.ame	5		5	5	5	5	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5
Vio.adu	5	5	5	5		5		5		5	5	5	5				5	5	5	5	5	5	5	5	5
Ziz.apt				5			5				5							5	5						
Ame.aln	5	5	15	25	5	5	15	5	5			15	5		15					15		15	5	5	5
Arc.uva	25	15	5				5	5			25	25	25				35	35	15		15	15	25	15	5
Bet.spp				55	45		5	15	65	5		15		35	45			15		75		5			35
Lon.dio																						5			
Pop.bal												5		5										5	
Pop.tre	5		5			5	5	15		5		15					5	15			15		5	5	
Ros.aci	5	5	5	15	5	5			5	5	5			5	5			5	5	5	5				
Sal.beb					15									35	25										25
Sym.occ				5	5				15																
Vac.cae			5	5	5				5	5															
litter	5	5	5	25	25	5	5	15	25	15	5	5	5	25	15		5	5	5	35	5	15	5	5	25
bareground	5	5	5		5	5	5			5	5	5							25		5				

2010.0311	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric						9	10	5	40	3	6	3					1	15				2		1	
Agr.sca			1		1	1	1	2																	
Bro.spp									4	7			2								3				
Cal.can													1			2									
Cal.spp	1			5						1		3	1	10	2						3	2	2		
Car.spp	3	6	2	25	3	3	4	5		4		3	8	2	4	1		2	3	2	1	1	2	2	2
Dan.int			1														1	5	2	4					
Ely.lan					1	2																			
Ely.spp	2	4	5	9	5	6		7	10	6	4	7	12	4	7	1	4	3	3	3	3	4	4	5	4
Fes.hal		4	4	2	4	2	11	9	5	3	1	2	5		3	1	9	7	2	7	2	4	3	3	2
Fes.sax																				1					
Hel.hoo								1																	
Hes.spp			25	18	13	3													7	5			5		3
Hie.odo				1	1				3						1		2					1	1	1	1
Koe.mac		2		2			1				2		1												
Muh.spp							1	4		2			1												
Ory.spp	1																								8
Pas.smi			2		1			3			1														
Poa.spp																							1		
Sch.pur										1	5														

Ach.mil	1	5		2	2	2	2	2	3	1	1	2	2	4	2	1	2	3	3	3	1	3	2	2	2
Aga.foe	3	8			6	1			2		7	4	6	2	2		2			1					
Ago.gla						1		1	2								4	3		2					4
All.spp			2	1	1																				
Ane.cyl							2																		
Ane.mul					1					1										1					
Ant.spp						8																			
Art.cam			2		2	1	1																		
Art.lud		1	1	1	1															1			1	1	1
Cam.rot	1		1	1	1	1	1	1	1	1	1	1	1				1	1	1	1			1	1	1
Cir.fol						1																			
Com.pal			2	2	3	3		1	2	1	1		2					3	1	4		2	1	1	
Epi.ang																								1	
Eri.spp			3	2	1	3	5													1	2				
Fra.vir	40						7	8	5	6	30		4	8	7					2		5			4
Gal.bor	4	4	7	8	5	11	10	9	2	2	3	3	5	6	2	3	2	4	4	4	2	10	3	5	8
Gal.tri																					1				
Gen.aff																						1			
Geu.ale																	1								
Geu.tri																		1	25	5		8	1	8	3
Hed.alp						3	7	2	4	2	2	2	5			6	8	4					8	3	
Heu.ric				1													2				1	2			1
Hie.spp																									1
Lat.och	7	1						3	2	3		3	2	10	2	7	9			4	13	5		3	
Lil.phi									1																
Lit.can									7	3								1							
Mai.ste		1		1	1	2	2		1	3					2				2	1					
Ort.lut				1		1																			
Oxy.cam			1			2													5	3					
Pot.arg		1		4	2	1	1	3	2	2		5	3			1	1		4	2					2
Pot.pen			1																						
Pul.mul			1		1	1														1					
Sel.den						2														1	6				
Sis.mon			1	1	1	1	2	1		1			1					1	1	1					
Sol.can									5	6			4		48										
Sol.mis			5	9		5	4	8		1				3				1	3		4				9
Sym.cil					2		2	1		7		2	6	7	1	2				3					
Sym.lae	7	2	2	3	1			2	4		6	13	7	4	11	3	2	8		7		4	7		10
Tar.off																	1				2				
Tha.ven	7	4		3	3	2		2	3	2	1	5	5	7	4	5	3		9		10	7	1	5	7
Vic.ame	18	25		17	6	3		3	6	8	5	3	15	6	2	1	7	9	11	2	2	4	4	4	4
Vio.adu				1	1	1	1		1	1				3	1	1	2		1	1	2	1		1	
Ziz.apt										1					1	1									
Ame.aln	4	14	9	11	9	2	8	4	3	8		2	5			28				2	7				
Arc.uva											2	4	3												3
Pin.ban																30									
Pop.tre	5	20				1	22	3	12	2	3	5	30	60	8	60	5			4	30	10	10	1	9
Ros.aci	1	18				1	3	2	1	2	1			11	2	23	25	25	12	9	26	65	25	46	38
Sym.occ	10	7	3													10	4	1			7	10	5	5	2
litter	55	28	50	35	35	10	38	30	60	40	65	40	30	25	23	80	35	60	35	40	40	30	70	38	38
rock	1				1	2	1									1					1		1	1	2
bareground					2																				

2010.0312	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																				4					
Agr.sca																				1					
Bro.spp		2															3		5		7				
Cal.can														1	1										
Cal.spp	2					3		1		3		2											1	2	7
Car.spp	5	6	3	7	3	8	5	7	1	10	7	5	4	1	8	1	7	5	3	9		2	5	1	7
Ely.spp	2						5			4			1	1					2	8	8				5
Ely.vil		1	4			1			1		1	1	1				7	7	2			3	3	5	
Fes.hal																				15					
Hie.odo																				1					
Muh.spp							5				3	2			2										
Ory.spp	4	3	2					2				1	6			5	6	6	4						
Ach.mil										5									4	3			3		2
Aga.foe					2	5	1			2	10	6	5		7		5		9	3	15			5	7
Ago.gla																				2					
Ame.rot								7																	
Ane.mul											4														
Ant.spp												1													
Apo.and	6			6																					
Ara.nud	7		15	10				20	25									9							
Art.lud																				5					2
Cam.rot																				1					1

Cir.fol	8																								
Dis.tra				3																					
Epi.ang																	4						3	12	
Fra.vir		3		8				7	5					7	3	2	5	23	18		7		4		40
Gai.ari																				7					
Gal.bor	7		1	3	2	15	6	2		15	3	7		7	3	2	2	12	6	5	7	2	2	8	12
Geu.ale														5											
Geu.tri																2				8					
Hed.alp																	1								
Heu.ric																1					1				
Hie.spp													2		2	4		1							
Lat.och	6	10		4		15	4	6		2		3	3			7	1	8	7	3		2	5	4	7
Lat.ven	9	3	3	20		4	8		25	5	10	10		10	7	5	8				9				
Lys.cil														9			2	3							
Mai.can	4	2	2	6				8	2					4		1	1		1		3	1	2		
Mai.ste						2		2				5		4	4			3							
Mer.pan				4																					
Pet.fri														3											
Pot.arg																				4					
Pre.rac									4																
Pyr.asa			11	28									2	1				3				2			
Sis.mon																				1					
Sol.can	4	3				8	4	1	15			4			3		2	25	8						2
Sol.mis																									4
Sym.cil			5					3																	
Sym.lae					2		12			5	18			10	8		3			15				5	7
Tar.off	1											1	8								1				
Tha.ven					5	10		3			9		6	7				4	8	5	6		6		6
Vic.ame	11		3	9		6	6			15	4				20	1		6	9	4		4	7	5	13
Vio.adu	2	2		7					3			1	6						1		2				
Vio.can			8	4																					
Ame.aln			1	3	90	10	25	6	11	15	10	40	15	25	25	2	10	12	5	12				2	8
Bet.spp																	65						15		
Cor.cor	11	85	70	6				15					1	8		1	7					94	30	2	
Lon.dio		3															2	4	3				3	1	
Pop.tre	1	5		10		65	20	25	10	25	20		3	30	8	20		40	8	9			30	65	25
Pru.pen				30																					
Pru.vir	10											2												5	
Ros.aci	11	10	10	10	4	25	1	7	15	12		5			7	7	5	4	9	2		3	1	28	12
Rub.spp																					25	4	15		
Rub.pub	8	6	5	7				3	8									9							
Sal.beb																						2			
Sym.occ	12	4	2	1	30	4	25	2		5	30	30	30	15	60	80		7		8	65			6	30
Vac.cae																	1					1			
litter	90	90	90	90	95	89	90	90	92	90	75	90	90	90	80	89	85	75	80	75	88	90	92	92	80
rock	3			1	1	1	2	2	2		10	3	4	1	1	5	10	7	2	1	5	1	1		3
bareground												1													

2010.1171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										7				1	14		1		2					2	
Agr.sca				1	1					1			1					1	1	1		1	2	1	2
Cal.can											1														
Cal.spp					2					1				1	1	3	1		2	1	2	7			1
Car.spp	20	5	8	7	6	5	4	9	6	2	2	4	5	5	2	2	10	5	13	5	2	4	18	12	16
Dan.int		1	3	1	1								1										1		
Ely.lan					2																		1		
Ely.spp	6	4	4	2	4	2	3	4	4	4	5	1	5	4	4	3	5	2	1	2	5	5	3	2	5
Fes.hal		4		2	4	2	2	1	6	6	3			2	3	3			1	4	8				6
Fes.sax														1	1		1		1	1		1	1	1	
Hel.hoo										1															
Hes.spp																		9	12	2				1	
Koe.mac										1															
Ory.spp																1									
Pas.smi	1	1						1		1															
Sch.pur															14		1								
Ach.mil	2	2	2		1		1		3	1		1	2	1	1	4		3	1	1	2	1	1	1	
Aga.foe					4					2					1	2	2				2	6	1	1	
Ago.gla	5			2	2	1				2	1			1	2	2	1	4	3	2	2	4	1	2	3
And.sep																							1		
Ane.mul													1							5					

Ant.spp			1	7	1					11							1			6			5	8	7
Arn.ful																				2					
Art.cam					3																				
Art.lud					2																				
Cam.rot	4	1		1	1					1	1				1		1	1		1	1	1			1
Cer.arv																							1		
Coe.vir							1																		
Com.pal	4	2	1	4	5	1	2	1	2	3	2	5	2	2	3		3	4	6	6	1	3	12	4	13
Eri.spp			1	1	1		2	3	2	1			2		1	1	1		1	2		1	1		
Fra.vir	30	8	2	16	20	26	7	1		3	3	17	26	8	1	15			25	13	17	20	19	30	14
Gal.bor	16	9	10	8	4	7	3	12	3	4	6	3	7	22	3	1	16	21	7	9	4	8	7	2	
Gal.trf			1																						
Gen.aff													1												
Geu.ale	1																								
Hed.alp	11	8	9	2		2	15	3	3	4	14	2			2	7	5	3	1		5	6	3	2	
Heu.ric															1	1	1								
Hie.spp			3	1		3	2		1	3	2				1	1			1	7	3		1	1	1
Lat.och	3		1			1	2		7		6			3	2	1	2					5			
Lil.phi											1									1					
Lit.can	1	2	1					1						1				1						1	
Mai.ste				1	1	1		1		1		1	2	2			1		1	1					1
Oxy.cam			2						1																
Pol.sen	2	2	7	2	2	2	3	1	4	6	2	2	1	9	2	1	2	2	5	3		2	5	3	4
Pre.rac																					1				
Pul.mul				1					1								1				1		1	1	
Pyr.asa																1									
Sis.mon	2	1		1	3				2	3			1	1	1		2	2	1	1		2	1	1	1
Sol.mis	23	3	10	3		4	1	6	1	2	4	3	2	4	1	3		4	1	2	5	4	3	4	
Sym.lae	6	4	3		1	2	3	2	6		2	1	3	3		1	1	3	1		1	3	2		
Tar.off	1																								
Tha.ven	3	7	2		3	1	3	1	2	2	2	2		1	2	2	4		3	4	3	2	2	1	1
Vic.ame	4	3	3		5	1	6	1	1	1	8	6		2	1	7	6	3	2	1	6	2			
Vio.adu	2	1	1	1			1	1									1	2				1	2	1	1
Ziz.apt		3		2	1	2	3	2		1	2	1		2	1	2		1	1				1	1	
Zyg.ele		1										2						1		2				2	
Ame.aln	24				27				11	4		10		19	10	4		2					2	3	2
Arc.uva	18	75	65			5	56	31	62		60	75	26			76	7				32	2			
Pic.gla	1																1								
Pop.tre	8					4					21					7					3	5			
Ros.aci	8			2			2		4			2	4					3						3	1
Sal.beb	2																								
litter	30	20	35	50	40	55	12	34	40	55	11	7	30	25	80	10	26	50	35	17	11	13	26	23	23
rock				2																1		1	1	5	2
bareground										1				2							2		2	2	

2010.1172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp						2						2	3	2			2								2
Cal.can		4	2	1		7																			
Cal.spp							8	7	5		10	9		5	6					4	2				8
Car.spp	29	9	2	4	2	5		1						4		1	4	1	5		3	6	2	3	
Ely.spp	5	4	3	5	7	4	3	1		2	6	3		3	3	1	3			5				1	4
Ely.vil	1			2	1			15	17	8	4	7	15	60	30	2	15	5	6	10	11	6	4	10	9
Fes.hal					8	3	6		2	2	1									7					
Hie.odo		1																							
Koe.mac				1																					
Ory.spp																								4	
Sch.pur																			4						
Ach.mil		3		1	7		3	3	2	1		2		1	3			1	1	2	2				8
Aga.foe	2	3				3				3									2						
Ago.gla		4		5				2								2									
Ane.mul		1																							
Ant.spp		3																							
Cam.rot	1	1					1				1	1		1					1	1					1
Cas.min																									2
Coe.vir														1											
Com.pal	6			2	2										1										
Epi.ang																						4	8		
Eri.spp	2		2																						
Fra.vir	16	24	4	40	24	12	20	20	1		15	12	5	5	10	3	5		2	10	7	4		8	4
Gal.bor	12	4	8	8	6	8		4	3	7			3	4	12	2	4	5	4	6	4			1	7

Hed.alp	3		22	6	13		8	6	7	6		5	4	5	5	2			7	11	5			4	7
Heu.ric							1																		
Hie.spp				4	3		4	2	4		1														3
Lat.och			10	3	4	5	2	11	2	6	15		13	4	17		9	4	8	12	16	2	2	14	14
Lat.ven						5																			
Lit.can	1	5		7			3					1													5
Mai.can					1			5	6	5				4	15						3			10	
Mai.ste						2														2					
Pol.sen	4	2	3	2	3		4	1	2							3									
Pot.arg		1																							
Pre.rac																				4					
Pul.mul		1					1																		
Pyr.asa																						3			
Sis.mon	1	3																							
Sol.can						20				10						70	2	5				3		2	3
Sol.mis	8	3						4						4	6										5
Sym.cil	1	2			6					9			3			4	15	4	6						
Sym.lae		7		3	2	2		9	26	7	15	7		4	18	3	5	2		14		3			25
Tar.off												3	6			2	3					1			
Tha.ven		1	3	1	6	3	4		8	2	1	8	7	4	7	2	8		6	3			9	7	4
Vic.ame	8	10	4	4	10	5	25			7	7	13		4	6	5	15			9	3	7	6	6	2
Vio.adu		3				1	5	3	1		3	2	4	2		3	3		1		2	3	3	3	2
Ziz.apt			1				2																		
Ame.aln					3				12				9				13	8	7	2			25	5	4
Arc.uva			80	17		3	25	8			10	6			5					35					
Pop.tre	8	25	40	7	5	3	75	20	40	60	75	55	40	15	40	60	20	75	30	3	40	75	75	35	50
Ros.aci		3	2		3	1			9	21	15	10	5	9	7	3	29	12	8		20	30	10	11	3
Rub.spp																							7	30	
Sal.beb													3				30	25	25		30	30	10		
Sym.occ					1	1	2		3				15				5	6	6	8			11	10	3
litter	50	25	5	21	9	28	50	80	85	85	75	88	90	90	83	90	80	75	86	90	85	80	92	90	90
rock	1							3	2	1	2	2	5		2	2	2	5	3		2	5	1	1	2
bareground														2											

2010.1181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																							8	15	1
Agr.sca	1		1				2		2		2	2			1	7		1	1	4	1			4	1
Bro.spp																							4		
Cal.spp				20		8		2				3	2	1	11	1	3	2	30			4		5	4
Car.spp	3	2	5	6	5	3	7	4	1	2	2	1	5	1	4	4	1	2	3	1	1	1	3	12	3
Dan.int	4	30	6		6		1	2										1		5				4	
Ely.lan	1							2	1			1	1												
Ely.spp	3	4	4	8	4	7	5	4	1	4	3	4	4	2	3	5	5	3	5	8	3	3	15	12	5
Fes.hal	6	3	19	4	7	13	2	4	3	5	6	2	4	2	5	6	3	2	3	3	15	4	4	4	13
Fes.sax	1												1		1	1		1		1					1
Hel.hoo							1																		
Hes.spp		11									13	11	3				7	11	5	10	8				
Hie.odo			1																						
Koe.mac	3					1	2		1			2				3		2	3	2					1
Pas.smi	1							1					1			1					1				
Poa.spp												1													
Ach.mil	1		2	3	2	2	1	2	2	2	1	3	1	2	1	3	2	3	3	2	2	1		4	5
Aga.foe																							2		
Ago.gla	8	3	2		1	2	4	3	3		3	2	6	2	3	4	1	3	2		5	6	2	3	3
All.spp																					1				
Ane.mul				1			3		1		1					3	3	1				3		1	1
Ant.spp	3	3	2		4		15		25			8	2		7	3		2			3			8	3
Art.cam																				1					3
Art.lud												5					5	5			1				
Ast.lax													1							20					2
Cam.rot	1	1	1		2			1				1	1		1	1	1	1	1		1			1	1
Cer.arv													1												
Com.pal	3	1	3	3	2	2	3	4	4	3	2	4	2	2	2	3	2	6		4	2	2	1	3	6
Epi.ang						1																			
Eri.spp	2			2		1		1			1		2		3	4	1	2		1	4	3			1
Fra.vir	1						9	30		50				23	11				5			15			
Gai.ari											3														
Gal.bor	4	15	6	9	15	3	8	8	18	15	16	12	12	6	13	8	4	18	4	8	15	4	5	25	10
Geu.ale	1																								
Geu.tri							7					14	1			4					13	25			

Hed.alp	5	11	1	4	2		2	3	3	3	6		3	4	5	5	4		2			2	5	3	
Heu.ric		1				1		1			2											1	2		1
Hie.spp	5	3	4		1		5	1	1			5	5		1		3					2	3	11	3
Lat.och	2			16		1								13			2		1			45	8		
Lia.lig		1																							
Lil.phi			1			1					1														
Lit.can		1	1																3			1	5	2	
Mai.ste	2										1						1		1						
Ort.lut																									1
Oxy.cam										3						3		6			1				5
Pol.sen	1	2	3	2	2	8	4	2	3				3	2		1			4			3	3	5	
Pot.arg	3		1			2	3	3	2			1	4		1	2			2			2			1
Pot.pen																				1					
Pul.mul													1							1					
Sel.den			1			2			1				1		1	3					6	1			
Sis.mon	1	1	1			1	2	1	1		2	1	2	1	1	2	1	1	1	1	1			1	1
Sol.mis	1	2	8	7	5	3	7	1	9	3		1	3	3	4	17		6		12	3	3	3	7	9
Sol.rig																		2	4						
Sym.lae	2	2	1		1	2		1			1		1	3	6			3	5			7	2		2
Tar.off																				1					
Tha.ven	1	3	2	3		3	2	3	1		1	3	4	1	16	4	4		6			5	3		3
Vic.ame	6	6		13	1	1		1			4	10	5	3	1	6	2	5	3		1	3	2	4	8
Vio.adu	1	1	1	5	4	2	3	2	3	4		1	1		2	1	3	2		2	1	4	5	7	8
Ziz.apt	1		1	2	2		3								2	5		1				1		3	
Zyg.ele		1	1	1			1		1			1						2	1					1	
Ame.aln		1	4				2		5			2	6									1	1		
Arc.uva		10		12	28					30	25			87			80					16	75	14	
Pop.tre				27						70													12	15	
Pru.vir																						6			
Ros.aci	1			3	2					11	3					11	4	2	5	2	4	2			2
Sym.occ					1						1	1													1
litter	20	35	20	25	18	76	15	50	15	10	40	15	40	5	22	38	8	25	70	32	35	30	30	18	40
rock	1	1	1			3	1	1	10		1	1			1	1		6		1	7				16
bareground	4								3					1	2					1					

2010.1182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										25						5									
Agr.sca	2	1																			1	1			
Cal.spp				2	6	2		4	1		2	2	15	11	4	9	15	5		60	1		2	3	6
Car.spp	3	2	2		2	2			4		2	2	3	3	2	1	1		1			3	1		2
Dan.int																						2			
Ely.spp	6	10	5	7	7	8	5	2	10	4	3		7	5	7	4	1	2	8		3		3	7	7
Ely.vil		2	3	7			5		3			2	3		1		8	2					2		
Fes.hal	5	6	10	6	8	5	7	11	8	5	8	2	4	7	6	5	3	4	10	3	4	2	6	4	10
Hel.hoo							4					2			3										
Hes.spp																					2				5
Hie.odo				1	3				2										1					1	
Koe.mac										2												1			
Ory.spp													5												
Ach.mil	5	6	5	4	3	2	1	6	4	7		3	4	3	2			3	4	2	1	3	2	2	4
Aga.foe										1					7										
Ago.gla	9	3	3		8		4	2		3				2	3						1		5		
Ame.rot				2																					
Ane.mul								7			2				1	1						2			
Ant.spp	3		7								6					1					8	5			
Art.cam																						1			
Art.lud	4																								
Cam.rot		1	1			1		1	1	1	1	1	2	1		1	1		1	1	1	1	1	1	1
Com.pal							4		3	2			2	2	5	3			2	1	3	2			3
Eri.spp	6	1																							
Fra.vir	5			8	2	4		4	2		45	7	25		6	8		2	3		2	2		47	13
Gal.bor	9	13	8	8	6	10	10	10	10	6	8	7	6	4	9	6	11	13	6	4	17	14	4	3	8
Geu.ale					5																				
Geu.tri							2																		
Hed.alp	5	9	4	5	4	8	2		2		4	5	6	7			3	8	8	3	5	2	8	6	
Heu.ric		3			1		3			1					1										3
Hie.spp			1		2			8		6	4						2	4	3	10	6	3	1	6	4
Lat.och	2	33	20	21	4	15	17	8	10		6	10	9	4	3	15	8	17	2	7			8		
Lia.lig			2																						
Lil.phi								1													1				

Lit.can		5			2			2	14	9				10		1	3		1			1			2
Mai.can				4				1	1																
Mai.ste			2			3																			1
Oxy.cam	8						3																4		2
Pol.sen	3	5	4	1	4		5	2	4	2	2	3	7	3	2	8		1	5		3	2	3		4
Pot.arg										2												1			
Pul.mul							2																		
Sis.mon	1				2				1												1	1			
Sol.mis	5	14		2	3						5			2					1		3	4	3	5	10
Sol.rig	7		7													4									
Sym.lae	3	15	6	6	5	20	12	14	5	5	8	16	9	9	8	10	5	7	5	5	8	14	3	5	
Tar.off						2																			1
Tha.ven	4	5	5	5	3	9	4	2	2	2	2	1	4	3	5	3	5	2	5				6	2	3
Vic.ame	5	7	7	4	4	3	10	6				4	4	3		5				5	3	3	30	7	13
Vio.adu	2	12	7	4	4	6	8	4	1	1	5	2	3		2	3	3	3	1	4	4	5	3	8	5
Ziz.apt										3		1		3					3		2				
Zyg.ele				1						2			2		1			1			1		1		
Ame.aln		5																	8	5		5	11	9	9
Arc.uva	5	4	8	8	10		8	70	25	60	8	8		25	31				65	15	70			12	
Pin.ban			25																			2			
Pop.tre	10	50	30	65	8	25	50	15	16	3	29	25		4	2	35	30	50		10	10	16	13	20	27
Ros.aci	6		4	25	3	15	8	10	4		5	4	13	4		6	26	12	3	4	8	8	5	25	
Sal.beb																		1							
Sym.occ		8				5		5																	
litter	15	60	85	75	80	65	68	14	80	40	25	50	65	60	70	65	60	60	20	80	8	20	60	15	55
rock	2	2	2	1		4	2	2			1		1			3	1	4				6	2	5	1
bareground	1																								

2010.1271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric			12	2			2		3					11	1			3			3				
Agr.sca		1	1	1	1		1	2	2		5				2	3			3		2		1	1	2
Bro.spp						4																			
Cal.spp	3	2	3	3		3	9	4	35	3	4		6	2	2	3		15			1				
Car.spp	5	1	6	2	5	1	1	5	3	6	5	8	12	2	12	5	5			8		4	8	5	4
Dan.int	6									7	2					3						2	2	2	
Ely.lan		2								2	5	8				4	2		1			10	2		7
Ely.spp	5	3	3	3	6	6	6	5	5	2	3	6	5	5	5	5	6	20	9	2	5	4	8	4	6
Ely.vil				1																					
Fes.hal	3	10	7	4	6	2	4	4	3	14	18	5	16	4	8	6	12	8	9			5	2		
Fes.sax					3			2				4			3				1			2	1		
Hes.spp												7				6					6	4	2	3	
Hie.odo		1	3	1		2	1	3	2	2	2	4	3	1	1	2	1	2	1		1	1		1	1
Koe.mac					2	2		2	6	5	1		2		1	1		3	4		2	1	1		2
Muh.spp													2												
Pas.smi		1	2										1		1	1	2					1			
Poa.spp										1												2			
Sch.pur														4											
Ach.mil	2		4	1	2		2	1		1	2		2	3	1	1	1	2	2	2	1	1		1	2
Aga.foe	6	4		5		8	4	1			12	1		3	2		5	5		2					
Ago.gla		1	1	2	2		4			1		1				1					4		1	1	
All.spp																					2				
Ane.mul				2	1				2		1				3	1							2	1	
Ant.spp				40																	3	2	4		1
Arn.ful		2																							
Art.cam																3					1				
Art.lud											1	4				3				2					
Cam.rot	1				1		1	2	1	1		2			1	1	2	2	1		1	1	1	1	
Com.pal	1				3	1			5		3			3		2	2	1	2		4	2	3	4	3
Eri.spp	3	2	2	3	3		2	2	2	2	6	5	3	2	1	3	7	3	3		3	1	5	6	4
Fra.vir	50	5	20	2	11	35	40	53	29	2	17	4	3	5	14	4	7	17	4	17			1	3	2
Gal.bor	9	4	7	11	7	4	4	9	8	13	3	4	9	10		7	4	5	4	6	3	7	7	9	12
Geu.ale					1																				
Geu.tri															6										
Hed.alp		3	6	3	1	5	3		5									5							3
Heu.ric		1				2	1																		
Lat.och						8								4				3			1			6	
Lit.can	1	1				4	3				1	2	9			1		1			1	1		1	
Mai.ste	1	2			1	1						1			1				1	4				1	
Oxy.cam								1																	3
Pol.sen	3			3	2				1									5	4		4		4		3

Pot.arg		4		2						4	4	3	2	1	4	5	1	3			4	3	6	3	1
Pot.pen																1									
Pul.mul		1							1		1														
Sis.mon	1	1	1	2	1	1	1	1	3	1	2	1				1	2	2	1		1	1		1	
Sol.can						4								10									1		
Sol.mis	5	7	1	4	5			3	3	2	1		2		4	3		2	3		4	2		2	1
Sol.nem							4																		
Sol.rig	1											1													
Sym.cil														2						6					
Sym.lae	3	2	3		1	3	5	2		9	4	2	8	10	2	2		8			3	2	2	4	
Tar.off					1																				1
Tha.ven	7	5	7	3	3	2	7	3		3	10	2	4	2	4		2	5	3		1	4	3	2	2
Vic.ame	3	2	3		2	4	1	6	5	5	4	16	5		4	2	10	11	25	2	16	15	8	4	3
Vio.adu	1	1	2	1	1		1	4	3	2	4	3	1	1	3	3	2	2			1	2	2	1	1
Ziz.apt	1													4		1									1
Zyg.ele																			3						
Ame.aln	5	1	14			3	12	16					31	5				6							
Arc.uva		20																							
Pop.tre																								16	
Ros.aci	1	3	1		7	1		3	3		1	2			3	13	3		3	2	8	12	5		
Sym.occ					2	30		4	2	6					4	3			1	31	2	3	1	7	4
litter	42	35	55	9	25	28	60	25	70	65	33	65	40	50	45	55	68	30	40	15	38	25	40	28	70
rock	3	2		1	9	5	1		1	2	2			1	3	2	1	1		1	1	7	1		4
bareground		3			1					1															

2010.1272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										1		13					9				5				
Agr.sca		1									1						2		3					1	
Bro.spp				3			1												2						
Cal.spp	3		8	14	3	2	6	6	5		1		4	3				1						3	4
Car.spp	2	2	3	2	4	3	3	1	1	5	1	5		1	10	3	3	10	8	2	7	2	5	20	7
Dan.int												3			14										
Ely.spp	7	3	3	6	4	7		2	4	1	4	2	7	11	4	6	5	10	13	10	13	5	7	90	15
Ely.vil																			1					4	7
Fes.hal	3	1	6	1	1	1	1	2	3	1	3	1	4	2	1	5	2	1		7	3	3	20		4
Fes.sax		3			2												1								
Hel.hoo				6			2	2	3																
Hes.spp		7										6					4				2	8	8		
Hie.odo	2				2	3	1				1			1		1	1	2	1	3			2		2
Koe.mac		2							1		1										1				
Ach.mil	3	3	2	2	1	1	8	2	1		5	2	2	3		2	2	3	1	3	2	3	2	7	4
Aga.foe			1	3		10														3		2		10	1
Ago.gla			1	3					2		3		1	4	3	3		4	3			3	1	9	5
All.spp		1								1												1	1		
Ane.mul	1	2			2											1				1					
Art.cam																					1				
Art.lud																						7		6	
Cam.rot	1		1	1			1	1	1			1	1	1	1					1	1	2	2	1	1
Coe.vir									1											1					
Com.pal	5	5			7		2			7		3			4	2	4	1	1	2	3	2	1		
Epi.ang														4											
Eri.spp	6	1			3	6					6	11			3		4	3			4	5	4		5
Fra.vir	7		35	4	30	16		5	15		4	2	20	12	15	55	2	25	3	15			7		
Gai.ari					3																				
Gal.bor	13	10	3	3	8	5	16	4	3	4	3	13	11	6	8	3	11	7	6	8	2	8	6	6	3
Geu.ale	1																								
Hed.alp			8	3			7			3		7	8	5	4	1			6	8					4
Heu.ric											2	2			1				1						
Hie.spp	2														5		2		4	3		2		1	2
Lat.och	3		3	2		6	20	2	4	3			4	2		7			4	2				3	
Lia.lig																			4				1		
Lil.phi															1										
Lit.can	1	3	3		4			3	3			1	1				1		3				1		
Mai.ste	1		2	5	1		3	2	2		1	1	3	1	1	1	2	4					2		
Ort.lut					1										1										
Oxy.cam		5														4						2			8
Pol.sen	5	3	4								7	1			7	2	2	7	3	1	3		5	2	
Pot.arg	4	2			1						1						1	3		4	3	1		2	
Pul.mul															1						2				
Sel.den											3					1									

Sis.mon	1	1			1	1										1	1				2			1	
Sol.can	2						25				3													3	
Sol.mis	3	8		2	13	6		3			2	7			7	8	4	5	7	3	11	3	2	2	13
Sol.spa	1															1					1				
Sym.lae	11	2	10	5	7	25	4	5	12	2	15	7	13	8	2	4	7	6	14	13	5	5		5	
Tar.off																	1					1	1		4
Tha.ven	2		4	5	4	7	20	1	2		1	2	3	5	5	3	6	11	3	5	5	2	4	5	
Vic.ame	11	1	3	3		6	10	9	7	2	1	3	3	6	5	4	5	10	7	11	13	9	15	13	23
Vio.adu	3	1	1	2	2	4	2	2	2			1	3	2		2	2	1	3	1	1	1	1	2	3
Ziz.apt													1						2						
Ame.aln				1	3	3	15	14							2										3
Arc.uva	4		50			18	25	25	25	9	6	5	50	75	55			8	6	45	23				
Pic.gla	1																								
Pin.ban																									50
Pop.tre	3		3			10	40	10			4			1					5						
Ros.aci	7	14		8	4	5	8	7	12	15	5	7	2	2	4	6	4	2	1	2	9	12	8	5	
Sal.beb																			8						
Sym.occ	3		4	4	2			10	3	6			1	1			5	1				4			
Vac.cae						4																			
litter	40	40	45	85	25	15	15	30	30	5	10	45	18	10	5	20	30	16	25	10	35	45	75	90	75
rock	4	6	2		4		1				4	4				1	4	3	2		1	4			1
bareground					3						3		3				1	2	3		2	4			

2010.1281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric									14															9	9
Agr.sca		1	1		1	4	2	1	2	1	2	1	4	1		1	1	1		1				1	
Cal.spp	4	5	6	3	10	1	20	2				2		35	1		1	2		1	1	6	4	12	4
Car.spp	3	3	4	15	4	5	4	3	4	2	2	5		4	1	2		2	4	3	1	1	5	2	4
Dan.int												8													
Ely.spp	5	8	10	5	15	5	4	5	6	1	7	3	4	6	4	7	6	8	13	5	6	9	9	20	10
Ely.vil		1																				3			
Fes.hal	3		1	5	10	5	3	6	4		6	6	3	5	2	3	5	3	5	2	22	5	7	3	4
Fes.sax	1			1	3				3	1	2		1						1						
Hes.spp								27		70			14		1	16	4	17	4	4				6	30
Hie.odo	2	3	2		2		3	3	1	2	2	1		2	1		2		1	1	1	1	1		2
Koe.mac	2	1	2	2		1		3	2				1			2	1	2	3	1	1				
Pas.smi			1										1												
Ach.mil	4	1	1	1	2	1	2	2	1	2	4	2	2	1	2	2	2	1	1	2		5	1	2	4
Ago.gla	3		2	2	7	2	2	2	5	2	3	3	8	6	1		4	4	10	3			2	1	2
Ane.mul				3	1				1	3	1									1			1		
Ant.spp									2									2	1						
Arn.ful												1												1	
Art.cam									3	1							2	3		1					
Art.lud								1	1	1	2		2		1		2			1					
Ast.lax	2									7															
Cam.rot	1		1	1					1	1	1				1	1	2	1	2	1	1	1			1
Coe.vir			1																						
Com.pal		3		1	3				3	1			5	3	2	1		4	4	6	1		3	2	2
Eri.spp	3	5	1	5	5	2		2		2	3	6	4	5			2	9	10		1		1		
Fra.vir	56	25	45	20	7	3	18	25		19		38	8	2		2	4		1	45	5	3		6	
Gai.ari					1																				
Gal.bor	8	11	4	15	7	13	6	6	6	10	27	7	8	13	7	8	8	7	9	4	3	17	14	7	7
Gal.trf																								1	
Geu.ale	1				1																		2		
Geu.tri				1	1																				
Hed.alp	3			11													4		1	6			4	3	
Heu.ric				2			1																		
Hie.spp								1		1					3		3	3	7	3			2		
Lat.och		9			2					1		9										6			
Lia.lig						1																			
Lil.phi																									1
Lit.can							2						2	9				1					5		
Mai.ste			2	3				2		3	1	2	1	2	5				1	1				1	
Ort.lut			1						1				1												
Oxy.cam			1			1		1	2	2		4													
Pol.sen	5	5	9	9	8	6	6	5	9	3	2	3	4	7	9	3	3	5	6		12	1	20	5	6
Pot.arg			1	2		1	2			1	1	1	5	2		1	3	4	3	2				4	2
Pul.mul	1		1		1	1		1		1															
Sel.den		1		3	2		1		2	1		1	1												
Sis.mon	2	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	2	1	1		1	1	

Sol.can				1																					
Sol.mis	1	1	3		5	5	3	6	9	2	12	2	1	9	3	1	1	2	3	2	3	8	3	2	4
Sol.rig				2																					
Spi.rom			1																						
Sym.lae	4	1	4		4	3	3	5	2	1	5		2		11	4	5	6	6	5	2		27	15	6
Tar.off		1				1	1		1	3								1	1			1			
Tha.ven	2	1	2	1	5	2	3	4	3	6	7	4	5	10	1	1		3	5	7	2	3	3	3	9
Vic.ame	7		2	4	2	4	4	12	9	2	3		7	2	7	15	11	12	10	10	4	8	22	20	8
Vio.adu	3	3	3	3	4	1	1	3	1	1	3	2	1	2		2	1	1	1	2	2	4	5	2	2
Ziz.apt					1								1												
Ame.aln	9					20			10							8									23
Arc.uva															90		39			68	50				
Pop.tre																	15		6			50		2	
Ros.aci	7	1	7			6	2	3	4	2	8	3	6	14	2		4	6	4	2	4	23	3		4
Sym.occ	3	2	2		3	3	5	4		1	7	2	2			13	4				12				
litter	40	50	42	42	65	65	48	39	35	25	25	22	17	70	3	65	20	53	38	8	30	65	35	80	55
rock			1	1	6	1	13	1	2	2	1	1	8	1		1		1	1				1		
bareground			2		2							1						1							

2010.1282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				3																					
Agr.sca					1																			1	
Bro.spp								1	1	2	2	5	2												
Cal.spp	6		5	4	2	10	13	1	5	7	4	4	2		3	3		2	3					6	8
Car.spp		2		9	3		2	1	4		2		3	3	5	8	2	1	4		25	12	16	5	6
Dan.int																								3	
Ely.spp	2	4	7	2	4	2					3			3		4	6	6		5	1	3	2	2	4
Ely.vil		10	40	11	3	10	7	3	20	14	40	25	40	3	29	4	13	4	20	4					
Fes.hal	9	11	1		1					1	1						1	11		2	3	4	1	2	2
Fes.sax																					1				
Hes.spp	3																								
Hie.odo	2				1											1				1				2	
Koe.mac				1	1																		1		
Sch.pur					11		2					2													
Ach.mil	2	4	1	4	4	1	1		2	2	4	2	4	2		4		6		2		3	3	2	4
Aga.foe						5										2					4				
Ago.gla		4	2		3																				
Ane.mul													1	2								2	3	2	
Ant.spp																						2			
Cam.rot		1		1	1					1					1	1		1		1		1	1		1
Com.pal					2					2										1	4	5	1		3
Epi.ang									6			5													
Eri.spp					2																2	2	3	2	
Fra.vir		3	16	7	7	15			7	1	11	3	7			8		10		20	29	20	28	20	10
Gal.bor	8	10	5	6	14	3	5	5	7	5	5	5	4	6	8	10	2	9	3	7	13	27	7	7	13
Hed.alp				1	12				3				11	5				3			1	3		8	8
Heu.ric				2	2				2							3					1			1	
Hie.spp	4	2	2					1										2							
Lat.och	30	13	18	4	4	6	8	4	8	5	23	8	4	7	12		14	5	3	2			2	1	
Lit.can	3						2	2																	
Mai.ste							3				2		3				1	4	3	2		1			1
Oxy.cam																2				4					2
Pol.sen			2	9	5											3		5	1	6	3	4	6	7	5
Pot.arg																3									
Pul.mul																3									
Sis.mon					2																				1
Sol.can	2					3	3		6	25	5	8	13	9					13						
Sol.mis					8										6	6		5			3	8	2	5	
Sol.rig																							8		
Sol.spa		3						3																	
Sym.cil														20	4										
Sym.lae	3	16	20	3	4	12	4	3	3	18	7		17	5	6	9		6	1	13	3	5	3	3	12
Tar.off			1				1		3	1															
Tha.ven	8	8	7	1	4	9	10	2	4	4	9	10	3	4	9	3	23	5	8		4	12	7	2	3
Vic.ame	3	6	14	3	8	6	11	3		13	9	7	7		5	8		2	5	5			4	5	9
Vio.adu	4	5			2	3	2	2	8	2	3	1	3	2	3	5	2	2			4	5	3	1	3
Ziz.apt					1																				
Zyg.ele					2																1				
Ame.aln			8	1	15	11		2			1			4	25			2				5	3	1	7
Arc.uva	10			30	10	1							4	9		18			4	70		2			

Pop.tre	65	45	15			25	50		60	30	70	46	30	60	75	7	65		40	1		2	3	5	1
Ros.aci	4	18	3	2		30	10	10	4	10	2	12	10	15	14	10	60	53	40	12	2	10		1	5
Rub.spp							30																		
Sal.beb										2															
She.can								90						50											
Sym.occ	8						4		7	1	15	5	2			7	16	5	5	4	2	8	5	3	3
litter	60	55	65	45	50	90	85	95	79	75	86	90	90	80	91	50	93	75	85	12	20	15	12	60	60
rock	6	2	1			1	4	1	10	3	4	1	1	1	1	2	1	3	3	1	5	5	2	1	5
bareground																					1	1			

2010.2112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																				4					
Bro.spp			1	3		5	4		4	2			2	2						2	2		2	3	
Cal.spp	3				3		6		6	3	5		1	3	10	10	7	5		4	15	16	7	13	13
Car.spp		1	6	6	9	6		7	2	15	3		11	9	15		4		40	25	11	10	12	15	4
Dan.int																		6							
Ely.spp		3								6	7			1		3			2	2					5
Ely.vil	1	12	12	50	20	6			20	25	2	4	2				5	2	6	1					
Fes.hal					5		2				1		2	2	2				1	11			1	2	6
Hel.hoo						15					3	9	3			2	6	1					4		2
Hie.odo										2														8	4
Sch.pur	11		4			3	20	12			2	3		1		3									
Ach.mil			2	2	1	2	1			4		2	1	3	2		6		4	1		3	1	1	5
Aga.foe			4	10	8			7																8	1
Bot.vir																	1								
Cam.rot			1	1	1					1					1				1			1			
Com.pal															1										
Epi.ang	9	7	6	3	11	14	5	6	7		12	3		12		6	9	8			6	7	9		
Fra.vir	6	5	8			2	8		2			6	5	1	15	1		3	10	15				20	5
Gal.bor	2	5	3	3	3	3	4	4	4	2	7	4	3	5	3	4	7	2	7	4	7	8	5	3	2
Geu.tri																	2								
Hed.alp	3		4			10	6			5															
Heu.ric		1										1													
Hie.spp															28				4	1	1		1	1	
Lat.och	8	13	9	17	14	7	10	13	16	13	3	11	15	8	10	10	9	19	25	12	11	15	14	7	4
Lil.phi																	2								
Lit.can														1											
Mai.can																1									
Mai.ste	2	1	4	2	2		3	2	3	2	8	7	9	3	4	7	15		2			9	2	10	3
Mit.nud			1				1																		
Pot.arg					2										2										
Sol.can				10	19					3		2	7	12	5			3	10	25			8	9	9
Sol.rig																								1	
Sol.spa																			3	5	1		1		3
Son.spp										26					28				3		3		2	5	
Sym.lae				5		8				15					4			3	8	7		4		9	13
Tar.off	1			3				2										2							
Tha.ven	10	7	4	4	4	12	16	4	8	2	11	5	7	10	4	11	8	2	6	3	11	10	6	5	4
Vic.ame	6		5	4	4	7	9	2	5	10		8		17	22	7		4	50	15		5		2	10
Vio.adu	7			4			6	5	4	1		7		2	1	3	5	1			3	3		2	4
Cor.cor		2					45																		
Pop.tre	10	80	50	15	18	6	20	75	75	1		50	70	60	20	55	70	70	30	75	80	75	65		40
Ros.aci	9	9	8	9	4	7	13	16	11	3	45	10	9	4	10	3	12	7	7	5	11	8	5	5	9
Sal.beb	15				12	25	15	70				1													
Sym.occ	8	8																							
litter	90	80	75	85	50	70	65	68	55	42	70	80	87	85	70	82	85	85	50	70	90	87	92	70	82
rock	5	6	1	1		1	4	3	2	1	10	4	1	1	1	2	2	1	1	1	1	1	1	1	1
bareground										1														1	

2010.2171	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric			3	4								5				9							15	3	
Agr.sca		1		1		1							1				1				1		1		
Cal.can																			3	4					
Cal.rub																									3
Cal.spp			2	1	4				1	1		8				4								12	5
Car.spp	5	4	3		6	2	6	2	2	6	3	3	3	3	2	5	1	3	8		2	2		3	
Dan.int	2					1					2														
Ely.lan															2						1	5	3		

Ely.spp	11	10		4	6	3	2	2	4	6		8	5	1		5	7	4	30	12	2		7	15	2
Ely.vil																				3					8
Fes.hal	4	6	15	14	7	3	11	8	6	4		4	15	1	9	5	2	3	10	5	5	11	6	5	4
Fes.sax				1		1											1				1				
Hel.hoo																						2			
Hes.spp																	1	6							
Hie.odo		1	1	1	1	1				2					2	1								1	
Koe.mac										2		2	3	1	1		2	2				1	1	1	
Muh.spp								1					1												
Pas.smi		7					1	1		1		1				1									
Sch.pur		2	4																						
Ach.mil	2	1	1	1	3	1	1	1	1	2	1	1		1	3	1	1	1	3	3	1	1	1	3	3
Aga.foe		1	1			1	1	1		1			4												5
Ago.gla	2	1	3	1	3	1	1	1	3		1	1	1	2	1			2	1	2	3		3		
Ane.mul															1			1							
Ant.spp			1			7			3					3	6										
Arn.ful							1	4																	
Cam.rot	1	1	1	1	1	1		1	1		1		1	1	1	1	1	1		1	1	1	1	1	
Cir.fol		1	1			1																			
Coe.vir				2			1	1	3								1							2	
Com.pal	6	4	2			5					1		1				3	2				3	2		
Eri.spp						2	2						1			2	1	1			2	1	2		
Fra.vir	30		5		9	52		38	14	19	65	28	19	20	15	12	10	28	7	5	9	25	2	8	4
Gal.bor	7	8	3	7	4	4	8	7	5	5	4	4	8	2	5	3	11	8	8	8	11	11	7	5	3
Geu.ale																									1
Hed.alp	8	1	2	3	3	3		2	5	3	2	1	5	8		4	1			4			1	6	5
Heu.ric									1	1				1				1				1	1	1	
Hie.spp															2				2	1	1			1	3
Lat.och	9	2		2	4		1	2	3	7									4	30				3	6
Lil.phi			1	1								1	1						1						
Lit.can			4		3	1		1	5	2	1	2		1		1			1				1	1	
Mai.ste	2						1							3		1	2			2	1	1	1		
Ort.lut																		1							
Pol.sen	2	7	3	8	4		7	5		3		1			3	1		3						2	
Pot.arg										1		1						1	1		1		2		
Pul.mul	1			1							1			1											
Sel.den			3	1		1		5			4										2				
Sis.mon		1	2	1	1	1	1	1	1	1		1	1	1	1	1	1	1				1	2	1	
Sol.can						2														1					1
Sol.mis	3	3	4	5		2		2	1	3	3	1	1	6	3	3	9	2			4		3	4	
Sol.spa		9						8	8	3	2			3			2						2		
Spi.rom											1														
Sym.cil									1			1													
Sym.lae	3	2	1	3	13	1	4	1	4	10	2		1	5	2		2	2	4	5	2		3	3	7
Tar.off	2																							1	
Tha.ven	1	3	3	3	2		2	1	2	2	1	2	3	4	3	2	3	4	10	4	1	2	4	6	4
Vic.ame	5	5	6	4	7	3	8	3	10	6		16	7	3		1	6	1	5	15	1	3	6	12	
Vio.adu		2	3	1				1			1	1	1	1	1	1	1	1			2		1		
Ziz.apt															1										
Ame.aln	5	8		6	14		10			6		5						2	12			5			2
Arc.uva																	12							1	
Pin.ban									7										12						
Pop.tre			20		13	6									3				65	55					30
Ros.aci	9	6		5	1	4		1	3		2		9	24	7	15	5		3	25	4		2	4	6
Sal.beb																									55
Sym.occ		3	3	5	12	4	7	1	21	3	2	4	3	10	2	3	3	2		3		2			
litter	10	34	50	55	28	12	50	18	15	28	5	35	30	6	35	46	27	40	60	15	12	35	40	28	60
rock	5	2	1	2		8	7	1			6			8	4	1	1	1			2		3		
bareground									1		1	3						1							

2010.2172	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																6	10								
Agr.sca																					2	1	1		1
Bro.spp			2			1			1																
Cal.can											4														
Cal.spp	3	5	3		1	20	8	5	3	1	9	2	5	1		3	3	2	7	4	4	4	1		
Car.spp	7	2	2	2	1		3	1	2	2	6	2	5	4	2	5	4	10	14	3	5	3	4	2	9
Ely.spp		4				3		2			3	1	3			3	3	1	4	2	1	3	5	2	4
Ely.vil		15	20	4	2	6	7	25	8	3	5	10	7	7	8				3	6					
Fes.hal							3					1	11			3	2					6	1	1	1
Fes.sax																					1			1	1

Hel.hoo	3								3				4		1										
Hes.spp																					2	4		7	
Hie.odo																1	2	1				1		2	
Koe.mac																							2	1	1
Ory.spp				2						1				6	8			7							
Sch.pur					1																				
Ach.mil		2	3	1		1	4	1	2		4		4		1	2	4	1	3		4	3	1	3	2
Aga.foe		1				4																			
Ago.gla																2									
Ame.rot			8	5	4		4	7	24	7		6	1												
Ane.mul																	1								
Ant.spp																								5	11
Art.lud																									1
Cam.rot	1	1						1	1							1	1	1			1	1	1	1	1
Coe.vir		1					1									1	1								
Com.pal																					1	1	5		1
Cor.can					4																				
Epi.ang					3																				
Eri.spp												1				2	5					4	2	2	1
Fra.vir	5	2	4	3	2		10	15	6		11	6	15	4	5	50		24		3	75	45	60	1	65
Gal.bor	5	2	8	2	2	5	6	3	8	1	6	5	3	4	3	7	3	7	5	5	3	3	5	13	4
Hed.alp	6	2	2			6	5	5	8	6	7	3	4							8	4	13	2	1	1
Heu.ric												1					1						1		1
Hie.spp			2			1	1				3					1					1	4	1	2	1
Lat.och	2	2	12	4	12	4	5	4	3		5	13	9	5	6	3	7	6	13	12	3	2	3		2
Lil.phi											1														
Lit.can							1									5						7			
Mai.can			1							1															
Mai.ste														2			1	3	2	2	3	1	2	2	1
Ort.lut																								1	
Oxy.cam																	7							6	
Pol.sen						1										5	4				1	5	6		2
Pot.arg																2						1			
Pul.mul																					1	2	2	1	
Sel.den																1									
Sis.mon																					1	1	1	2	1
Sol.can					1		5						3	5	4					6					
Sol.mis											5	2	4			9	3	2	3		4	2	11	8	6
Sol.spa																						1			
Spi.rom																					1				
Sym.cil			2	2					5	3		12													
Sym.lae		3		4		4	8	8	2	1	9		6	3	7	3	6	3		6		8	2	2	4
Tar.off											2				1		1			2				1	3
Tha.ven	2					3	3	6	7	1	6	7	8	3	4	5	1	4	12	9		12	1		5
Vic.ame			3			3	8	7	8		5	7	50	1	2	6	4	5	3	4	7	3	3	2	8
Vio.adu			15	4	5	1	2	1	1	2	1	1	1	2	3	1	1	1	2		1	3	2	1	2
Ziz.apt						1																			
Zyg.ele			1														2								
Ame.aln	8				3			5	9	4	15		15	8	6					5		5			
Arc.uva							10					20					15						4		
Lon.dio			3			8						2													
Pin.ban	20		1	50								15	3			5									
Pop.tre	4	7	30	25	60	75	2	25	25	55	30	7	22	70	25	4	2	25	65	48		3	2		13
Ros.aci	4	29	8	9	4	25	11	13	15	25	7	10	6	25	8	1	7	18	17	1	5	5	6	9	3
Rub.spp				4	7				9	6															
Sal.beb			13				14																		
She.can			26					7	6																
Sym.occ	39	12		6	9	6		8			2					6	12	5	6		4			8	
Vac.myr					20																				
litter	80	75	65	95	80	65	25	85	85	90	90	65	65	90	85	28	40	68	80	90	25	50	18	20	15
rock	1		5	2	1		20	1	1	4	1	1		1	2		3	4	1	1	2	4	6	35	5
bareground																	2						9	3	1

2010.2181	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				4	3		1	4				3					6	4	3	3			1		
Agr.sca				1						1	1	2			2	1			1			1			
Cal.spp	22	9	9	3	4	4			20	1	10							4	13		3	2		25	4
Car.spp	4	1		4	4		1		2	2	5	3	5	2	4	2	1	3	1	2		4			2
Dan.int					8					2		1			2	5		2		7		27	12		2
Ely.spp	15	4	6	6	8	7	20	7	5	15	13	12	15	13	5	8	10	7	7	15	5	4	8		15
Ely.vil	5	5	19	14		55	5	20	20				5	3			3								
Fes.hal	2	7	4	3	2	3	5	3	3	6	4	6		4	6	7	3	3	1	10	2	2	7	4	7
Hes.spp											8				17	12			4		4	4	5		
Hie.odo		2	2	2		2		1	1	2	5	3	8		5	2	2	2	2	2	1	5		2	1
Koe.mac			1							1	2		1		1			1							
Muh.spp																		5							
Ory.spp																				1					4

Ach.mil		4	3	3	4	2	7	2	3	2	2	4		4	4	3	6	3	3	1	7	5	3	2	2
Aga.foe					8					6															
Ago.gla				1	4		1			4	2	5			2	2	4	4	1	7		4	5	3	6
All.spp																						1			
Ane.mul					1				1								1	2						1	
Ant.spp										1												3			
Art.fri											3														
Art.lud		2														5		6			15	1	13	4	
Ast.lax													15												
Cam.rot		1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1		2	1	1	1	1
Coe.vir																							1		
Com.pal		1								1		2			1	2									3
Eri.spp		2		1	3		1	1		2	4				3	2	2	5	2	4			2		
Fra.vir																5									
Gal.bor	9	4	5	7	7	7	4	7	3	14	4	7	3	12	4	6	5	10	5	5	10	3	7	10	4
Gen.aff				1								1													
Geu.tri			4				8					8					8					3	4		
Hed.alp		2	4	3	3			8	3	6		2	4	5	7	2	3			8		3		1	8
Heu.ric						1	7								1						2				
Hie.spp			4	4	1					3							1								
Lat.och		7	14	15	3	8	27	9	7	3		12		15	1				12	19				7	10
Lit.can										1					1										
Mai.ste	3	6	3	6	4				4	2				1	2	1			2						4
Ort.lut																						1			
Oxy.cam	6										15				7				1			3			
Pol.sen				3			6		1		5	4				6	1	4	4				2		5
Pot.arg																						1	1		
Pot.pen																						1			
Pul.mul				1																					
Sel.den		2	1	1								1					1								
Sis.mon				7	1					2		1			1	1	1	1	1			1	1	1	1
Sol.can									1																
Sol.mis		1	1		3	3	1	2	4	9	11	3			12	6	7	5	4	1	5	10	6	8	
Sol.rig																8									
Sym.lae		4		8	5			9		1	3			6		3			6			1	1		10
Tar.off	1					1		1		1		1										1			
Tha.ven		2	7	10	6	1	6	4	6	7	1	5		5	3	8	9	3	2	5	9	2	7	8	4
Vic.ame	4	12	5	8	5	13	7	9	4	2	6	6	15	3	6	8	9	4	3	6	6	12	5	11	10
Vio.adu	5		5	1	3	1	3	4	3	1	2	2		1	2	2	1	1	1	1		1	1	1	
Ziz.apt					1				2	1				4			2			3					
Arc.uva		28	15	18			30	4				3		85			6	25	75	70	90		10	27	60
Pin.ban	75					70		5					70												
Pop.tre		28	7	8	3		3	20	30			30					32			10				28	10
Ros.aci		25		3	3						8					2					3	1	3	
litter	50	55	65	40	65	60	25	30	75	70	59	45	50	4	45	60	50	18	10	60	7	70	65	60	20
rock			1		1	4		20		4		4	2		4	2	1	2	1				1	3	
bareground		1			1						1							1							1

2010.2182	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																8									
Agr.sca		1	1	1		1					1														
Bro.ine								10	5																
Bro.spp											2	4	1						2		2	3			
Cal.spp	30	4	3				7	3	6							10						3		2	
Car.spp	5	5	5	4	4	4	5	3	3		2		4	6	5	4	5	10	6	2		3	22	8	2
Dan.int			4	6																					
Ely.spp	15	9	7	7	16	7	7		1		30		2	3		3		3			6				
Ely.vil									5	35	4	25		14	30		7	7	4	13	4		6	15	13
Fes.hal	1	7	3	4	8	35	8		2		6	5				5					3	4		1	1
Fes.sax		1		1																					
Hel.hoo																2	7				17	19			
Hes.spp		3	5	8	3		2																		
Hie.odo		4	1		3	5	3	1			3					7					1				
Muh.spp																	3	4							
Pas.smi				1																					
Sch.pur													8		2		4		8	2					
Ach.mil	6	2	6	5	8	5	4	3	2		9					4	2	1			1	7			1
Aga.foe	3															3									
Ago.gla	3	3	5	3							3										3				
Ane.mul											1														
Ant.spp			1																						
Arn.ful						2																			
Art.lud		1	6	11	1	4	2					2			2	2					2				

Bot.vir																						3			
Cam.rot	1	1	1	1		1	1			1	1	1				1	1								
Cir.fol																20									
Com.pal											3														
Epi.ang										1			6	6	2		22	7	2			3			
Eri.spp		4	5	6				4			5														
Fra.vir						1	26				2		23		5			3	8	4					1
Gal.bor	6	5	3	6	4	3	8	9	4	5	7	9	3	1	5	3	5	5	4	6	3	1	4	3	2
Geu.ale	5																								
Geu.tri			12								15														
Hed.alp	2																								2
Heu.ric				1										3											
Hie.spp		1	1		2	2																			
Lat.och								16	10	7	10	5		4	14	15	16	10	3	3	10	5	6	10	
Lia.lig	1					2																			
Lil.phi		12							1																
Lit.can			1	1	1	2																			
Mai.can													3					13							
Mai.ste	1	1			1		1	3	3		1			3	13		1	13	2	20		2	5	2	25
Mit.nud								1																	
Ort.lut		1	1	1		1																			
Pol.sen		5	1		3	7																			
Pot.arg		1	1	1		3																3			
Pot.pen			4																						
Pyr.asa																									20
Sel.den			1	1	1																				
Sis.mon	1	2	1	1		1																			
Sol.can							40	7	4	26			7	10			25		6			10		28	
Sol.mis	3	4	5	12		18	5		1		5					5									
Sym.cil															12										
Sym.lae		5	3	4	2	2	15	9		6	6	9		4				6		3	4	8	3	4	7
Tar.off				1	4		4		2				8	3			3		3		1				
Tha.ven	12	10	3			4	11	8	8	10	2	25	9	3	6	2	6	5	15		4	10	9	5	4
Tri.pra											1														
Tri.rep											7														
Vic.ame	3	9	13	8	15	12	14	7		3	6	4				15	10				7	7		9	
Vio.adu		1	3	1		1	2	2	2	2	3		2		3	2					1	2	2	2	2
Ame.aln																						40	55		
Arc.uva	40										5		13												
Bet.spp																				20					75
Pop.tre				4	15		5	80	30	48	20	75	70	40	75	7	65	40	25	25	30	35	60	70	70
Ros.aci	3		5	8			3						5	5		13	10	12	25	5	26	12	20	5	
Sal.beb																								30	
Sym.occ			17	6	16			12	9		1		4	19				3	6			6			
litter	65	65	45	30	75	75	55	85	90	90	40	75	85	88	85	80	90	95	90	92	75	85	90	90	86
rock		3	7	5	1	2	4	3	6	3	3	14	2	2	5	2	1	2	4	1		2	3	1	3
bareground		1																							

2010.2212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				3							3				3										
Bro.ine			1	2	4								6	7	3					4				7	21
Bro.spp	2	1	1		1			2				2		2	3	5	2	2		2		2	4		
Cal.can				1	2																				
Cal.rub					7																				
Cal.spp	5									5	5		30	5	11	20	4	4	1	5	6	1		3	
Car.spp	15	20	1	1	2	3	3	2	4	6		7		8	1				3						
Ely.spp					25			1										3	1			2	2		
Ely.vil	65	30	40	90	50	90	80	80	60	17	19	55	30	25	15	10	50	40	15	6	9	65	7	40	15
Fes.hal											1		1							4					
Hel.hoo																			3						
Sch.pur										2				2		2				5	2		5		
Ach.mil	2	1	1	2	1		2	1	2	1	2	2		2	2	3	2	3		3		1		2	1
Aga.foe								6				6													6
Cam.rot										1		1	1		1			1		1					
Com.pal																				2					
Epi.ang				6											6				2	3			5		9
Fra.vir	3		1	2	20			1	7		7	5	8	10			7	9	5	2	15	7	8	6	
Gal.bor	1	2	4	5	3	2	9	2	4	4	3	4	3	3	2	5	3	4	2	3	4	5	6	1	2
Hed.alp							11			2	8	3	11	4	6										
Heu.ric															2						2		1	1	
Hie.spp			1																	2					
Lat.och	11	5	30	3	9	16	10	15	18	26	6	20	16	6	2	8	8	10	7	13	4	23	9	5	
Lil.phi													1												
Lit.can				1																					
Mai.ste		8	1	2	10	4		8	6	3	3			1	3				7	2				2	4

Mer.pan			6																						
Mit.nud	2																								
Pot.arg	4								3											2		2			
Pyr.asa	2							1									6				2		4		
Sis.mon				7																					
Sol.can		7	7					3	6	18	2	10	6	14	5	5	5	6	6	9		8	2	7	
Sym.lae	4		1		2					3		7		19				5		1			3	2	
Tar.off																		1		2					
Tha.ven	9	15	12	4	4	9	22	7	12	4	12	5	6	4	3	8	3	7	4	8	9	4	9	10	2
Vic.ame	4		1	4	4		4		15	6	4	7	4	5	10	15	12	5	3	8	10	2	2	4	20
Vio.adu	1	1	2		1	2	1	1			4	4	4	1	1	1	2				2	4	2		3
Ziz.apt													2	1	2		1			2					
Bet.spp															10				15	8			11		55
Pop.tre	68	80	31	60	5	45	60	65	60	50	70	30	40	20	2	11	80	35	90	40	68	70	80	60	70
Ros.aci	10	25	2	25	5	6	19		8	10	40	6	10	5	25	16	3	11	8	4	14		5	4	7
Sal.beb			15								25	15		10			15		85	11	95				
Vac.cae																							1	1	
litter	80	85	76	70	85	30	40	40	70	80	75	55	50	40	75	85	75	75	85	86	90	90	86	80	65
rock	1	1	2			1	1		1		1	1	1			2	3		2	1	2	4	1	2	2

2010.2271	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric	8		14	12	2								3	3								10			
Agr.sca	1	1		1	1	1	2	4	2	1	1	2	1	2	2	1	1	1	2	1		2	2		
Cal.can																									18
Cal.rub	1																								
Cal.spp						2			4	2	1												40		
Car.spp	2	2	2	2	2	3	3	4	1	8	10	2	2	3	5	5	2	2		4	6	7		3	
Dan.int	3	8	1	1										2			11	20	12						1
Ely.lan										1						5	4								
Ely.spp	5	4	1	3	3	2	3	4	3	1	1	3	1	5	5			3	15	6	4	8	8	20	7
Fes.hal	1	7	1	3	5		12		20	1	6	3	3	2	5	14	4			5		6	8	7	
Fes.sax		1		2	2	1	1	1				1		1											
Hes.spp	6	10		3	4	7	7	19			1	14		3	16	2	4	4	5	4		3		1	
Hie.odo	1					1					2	1				1	1			1	1	2	4	5	2
Koe.mac	2	7		4			2	4				2				2				3		3	2		
Muh.spp																					22				
Ach.mil	2	1	1	1	3	4	1	1	1	2	1	1	1	1	2	1	1	1	3	2	5	4	4	8	1
Aga.foe	1				5	1	6		5	12	9	20	16	2	13	1					3	8	3	8	
Ago.gla	2	1		2	2		1	5		6	3		8	9	5	11	3	1	1	1			5	2	2
All.spp		1	1	1			1	1	1		1														
Ane.mul			1				4												2			3			
Ant.spp			4	1				5												2					
Arn.ful									1			2													
Art.cam			1			1	5	2		2		1	1	2											
Art.lud		2	5				4					1	2			1	1	3			1		4	3	
Ast.lax		2						1										1			4				
Cam.rot	1	1			1	1	1	1	1	1	2	1	1			1	1		1			1	2	1	
Com.pal	2	2				2	1		2	1	1			1	2	2	3		3	3			2		
Eri.spp	3	1		3	3	2	15	2		3	3	2	6	7		1	3	3	3	5			3	5	
Fra.vir	8		2			3											1				13				
Gai.ari					1																				
Gal.bor	8	10	5	5	5	6	4	6	4	8	3	6	4	2	4	2	6	12	10	6	4	4	2	5	
Hed.alp	3			1		2					2				4					2	1				
Heu.ric	1	1	1											1		1			1			1			
Hie.spp		2			2	3	1	4					1	1		1	1		3	4			1		
Lat.och									2												3	6	5		
Lia.lig									5	3									1						
Lit.can		2			1											1									
Mai.ste								4			1	1			1	1		1		1			1		
Ort.lut			1	1								1													
Oxy.cam		3			2							1							2						
Pol.sen	4	3			6	2	2			6	6			1	2	6		1		5	2		3	6	
Pot.arg	7		5	1		2	1	6	5	7			5	3	4	2	4		1	3			1	2	
Pul.mul	1				1	1							1	1											
Sel.den							2		1		1		3	3		1				2					
Sis.mon	1	1		1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	2		1	1	1	
Sol.can						3															4				
Sol.mis	3	5	2	8	3	4	4	6	8	5	6	2	1	2	2	1	2	1	1			4	6	3	
Sym.cil							1																		
Sym.lae	2			3		6			5	2		1	1		2							8		19	4

Tar.off	1				1							1	1	1	1	1								1	
Tha.ven	15	5		3	7		2	8	4	4	5	5	15	16	6		2		2	4	10	19	8	5	
Vic.ame	4	5	4	6	8	5	12	3	6	3	5	3		4	2	8	9	3	5	1	5	8	19	11	
Vio.adu	1		1			1	1	1		1	1		2	2	1	1	1		1				1	2	
Ziz.apt																				1		2			
Zyg.ele				1																					
Ame.aln	8			3	12		2	2		5	1					4					17	4			
Arc.uva		12																5						1	2
Pic.gla																									2
Pop.tre																							2	10	4
Ros.aci	6	4	9	7		6	4	5	7	1		7		6	2	2	1	5	9	4		4	1	7	7
Sym.occ		8	3	12	18			3	7	3				5	9	4			3			3			
litter	45	52	75	40	35	65	30	50	43	25	40	40	15	24	42	55	30	50	25	66	20	45	35	20	20
rock		5	1	6		1		1	1	2		2	4		1			3	1	1	23		1	2	
bareground																									25

2010.2272	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric				6	10																				1
Agr.sca																					1				
Bro.spp					2	2			2		2						1						7		1
Cal.rub																					2				
Cal.spp																	2						20	5	75
Car.spp	2		1											1	1			2			5	3			
Dan.int					1																			2	
Ely.spp	5	3	8	4	8		1	2	5	15		2	7	1	15				5	6	7	6	2	7	3
Ely.vil	75	35	9		3	12	16	5	20	80	2	4	3	5		1	7	7	25				3		
Fes.hal			1	9	1	2									2				1	7	10	4	2	7	
Hel.hoo				1							7	4	2												
Hes.spp																				4		10			
Hie.odo										1											2			1	1
Muh.spp								4				2				2									
Ory.spp							18	3				3													
Sch.pur																5									
Ach.mil	3	2	1	3	6				1	1		2			1					7	3	2	4	5	6
Aga.foe																	9						5	4	
Ago.gla			1		3																2	3	1	5	1
Ane.mul																						3	2		
Ara.hir																						1			
Cam.rot	1			1	1										1					1	2	1		1	1
Cer.arv				1																					
Cir.fol																								3	
Epi.ang								15	1				2												
Eri.spp					2																2	2	2	7	2
Fra.vir	5		9	12				7	5		4		2			5	3							1	10
Gai.ari																					2				
Gal.bor	2	1	5	12	3	2	4	3	4		7		3	4	5	5	5	4	4	6	5	5	7		5
Gen.aff										1															
Geu.ale					3																1				
Geu.tri				2	4																				
Hed.alp			5	1		2													4				7	3	8
Heu.ric			4		1								1		1					4					
Hie.spp			1	1	5					2					1									1	1
Lat.och		8	10	28	14	2		5	4	14	3	3	8	7		3	11	11	7			8		8	10
Lit.can					1															8			4		2
Mai.ste	9	7					2	1	11		6		2	4	1	2		3		1				2	2
Oxy.cam																					9				
Pol.sen					5															5		2	5	2	
Pot.arg				1						3												3		4	
Sis.mon																				1	1				
Sol.can	2					3	7	5		7			13			4	8	3					2		
Sol.mis					7						5									3	15	5		3	
Sym.cil													2												
Sym.lae	10	4	1	4		4	10		6	2	7	8		5		11	3	7	10	8	1	10	10	1	2
Tar.off		4							4	6	2	4			8	2			1			1		1	
Tha.ven	8	15	4		3	6	7	7	9	3	6	5	4	6	2	6	6	5	8			2	4	2	3
Vic.ame		2	8	5	7	4		4	5	6		2						5	3	15	2	2	15	2	5
Vio.adu	5	4	6	10	3	10	2		1	1				2	2	3	7	1	6	2	2	4	4		4
Ziz.apt																1									
Ame.aln						4			5		3			8											
Arc.uva			2	8	15																			30	4

Bet.spp									4		25	8				15	50	55							
Cor.cor									2																
Lon.dio								2				10													
Pop.tre	65	70	50	20	9	65	50	40	45	35	15	65	10	25	25	15	55	75	60	30	1	18	10	4	8
Ros.aci	12	1	3	6	9	3		1	8	8		2		8	30		10	1	38	35	25	3	8	20	30
Rub.spp								30				25	12				12	18							
Sal.beb											5					6									
Vac.cae								3																	
litter	80	90	65	55	50	60	80	85	88	30	90	85	90	80	30	90	90	92	90	85	65	75	65	35	95
rock	1	2	10	16		25	7	5	3	5	2	2	4	12	25	2	2	2	4		1	5	3		
bareground										1												1			

2010.2281	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric		14	10					6		8	3	5	17				4	6							
Agr.sca			2		1			1	1	1			1				1	1	1	2			1	1	
Cal.spp	5	7	1			10	20	9			10					7	3			2	3	6	2		
Car.spp	3	2		9	1	2	4	3	5	10	2	2	4	10	2	3	8	7	3	6	3	2	5	5	2
Dan.int		2	2	50	35	5		5	28	3		1	13		9	2	5	10		3		2	2	2	
Ely.spp	11	12	4	6	4	4		7	5	4		3	7	16	55	1	7	15	8	6	8	9	8	2	4
Ely.vil																4									
Fes.hal	2	2			4	2	4					4					2	3		2	1		3		3
Hes.spp			3		5				3					10				2	45	14			1	11	16
Hie.odo		1			5		1			2	1	1	1	2	5	1			1	5	2	5		1	1
Koe.mac			1		2				3						3		2	2	1	1		2	1	2	1
Muh.spp															4	1	2								
Ach.mil		3	6	4	5	4	3	4	6	2	2	4	1	4	4	2	2	3	2	3	6	2	2	3	3
Aga.foe	5	13	6			15	7	11			10	3	7	1		5	8	7			11	7	8		
Ago.gla			4	2	4	2		5	4	2	2			1	5	3	2	3	2	4	5	5	2	2	5
Ane.cyl																						2			
Ane.mul						1			1								1	1	1					1	
Arn.ful																	1	2							
Art.lud										1							1				2				
Cam.rot	1	1	1	1	1		1	1	2	1		1	1	1	1		1	1	1	1		1	2	3	1
Cir.fol		4								1				4				1							1
Com.pal		2	2	1	1		1	5	2	2	1	3	5		3		4	4		2	1	3	6	4	1
Epi.ang	8										4														
Eri.spp		2		1	4	3		1	2	4			2	5			3	3			3	2	2	2	2
Fra.vir	3					2		19				10				8	5	5		3	2	27	11		
Gai.ari																								1	
Gal.bor	7	6	8	6	5	3	3	4	4	15	3	5	10	2	15	5	6	4	5	5	7	6	8	2	6
Gen.aff	1																								
Geu.ale	3				1			1													1	2			
Geu.tri										19															
Hed.alp	4	7				8	2	1			4	2	8				1	1	2		2		6	1	
Heu.ric					2		1											1		1					
Hie.spp	5					3				2															
Lat.och	5		8	3		7		4			9	5	2	1	7	7	1					5	6		
Lit.can	3	12	5	4			1	4							4					1				1	
Mai.ste	4						2			2	10				3	2	1		3	2			1		1
Ort.lut			1										1											1	
Oxy.cam									5	1												1	4		
Pol.sen		6	7		1	1			2			3	4				4	3	2	4		7	2	2	1
Pot.arg	1	2		6		1			4		2						1	2	3	2	1	2		2	1
Sel.den													4	3			2						1		1
Sis.mon		1	1	1	1			1	1	1		1	1	1			1	1	1	1		1	1		
Sol.can			2			1	5									4					18	2			
Sol.mis	4	4	19	5	9	12	3	7	10	5	4	25	4	1	5		6	8	7	4		9	10	3	2
Sym.lae	1	10	5	5		15	17	10	3	4	8	11	2	1		7	5	1	7	4	11	7	3	1	2
Tar.off				1					1	1	2			1						1				1	3
Tha.ven	20	5	6	6	7	6	9	7	6	10	15	3	9	6	8	8	2	2	8	2	6	3	8	1	11
Vic.ame	9	5	12	7	11	4	10	3		7	8	10	1	7	6		3	1	6	8	3	14	9	2	5
Vio.adu	3	2	1	2	1	2	1	2	1	1	3	1	2	1	1	1	1	2	1		1	2	2	1	2
Ziz.apt							1				1														
Ame.aln												1					3					5			
Arc.uva							5					8				4	10						1		
Bet.spp			45			5	25					10				4									
Pic.gla			1																						
Pop.tre	65	1				25	40				19	20				50					70				
Ros.aci	15		2	1		1			8	1	25	3		8	9	21		5	6	12	9	6	8	9	13
Sal.beb								12			37														

Sym.occ					6														6					1	
litter	68	65	65	50	45	70	50	40	38	54	60	22	35	65	40	75	45	40	28	47	50	38	25	25	80
rock	2	1	2		1	1		3	2	1	1	3	1			1		4	1		1		13	10	1
bareground									1			2	1						12	1				4	

2010.2282	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric																				7					4
Bro.spp	1			1	2	2			1	1			2		2							2	4		
Cal.can							1	1									1								
Cal.spp								1					3		1	1		4		3	8	25	3	5	6
Car.spp		2	1	7	5				2	2	1	2	2	1		2						2	2		2
Dan.int																				3				2	6
Ely.spp		1			10												1		1	2	10			20	15
Ely.vil	11	7	1	3	10	4	2	4	6	25	5	15	12	2	8	6	5	2					1		
Fes.hal	1			1											5			6		3	4	2		1	7
Hel.hoo													2					3							
Hie.odo												3									2			1	1
Koe.mac																									1
Muh.spp					5																				
Ory.spp		2													1		1								
Sch.pur	1			2		2	2				1	1				2		1	5			2			
Ach.mil	2	1		3						4					4		1			3	3	5		4	3
Aga.foe			1		1				5	4					6								9	2	6
Ago.gla																				3				3	
Ane.mul																					2				
Ant.spp					2																				
Cam.rot																				1				1	1
Cir.fol																									4
Com.pal															1					2					3
Epi.ang				7				3	4			5		1		3	2					3	5		
Eri.spp																				2	1	2		2	2
Fra.vir	5	3	25	6	6	5	6	3	6	7		10	7	4	9			2			3	4	6	12	
Gai.ari																								1	
Gal.bor	2	1	2	2	2		1	3	2	5	1	1	1		9	1	1	1	2	15	7	4	2	8	2
Gen.aff																						1			
Geu.tri		1																							
Hed.alp										3		2	6	2			4				3	6		10	6
Heu.ric																		1			1		1		
Hie.spp																		4						2	
Lat.och	5	4		5	9	2	2	5	14	4	3	6	4	2	2	2	5	2	2		5	10	3	3	2
Lil.phi									1									1							
Lit.can				2	3					2										1	5	3	1		5
Lyc.spp																		1							
Mai.ste	1	6		5	2	7	4		2	1	4	8	30	2		4	6	3	6	2	4	5		6	
Oxy.cam																				2					
Pol.sen																					1				5
Pot.arg				1	3	2					1				3						2			5	
Sis.mon																									1
Sol.can	10			3	2	3	3		8	8	3				3	8			2		5	4	6		
Sol.mis										2										7				8	4
Sym.lae	11	3	4			9	5			7		9			4			3			3	3	7	5	8
Tar.off	2			6	5			3	4	2			3			1		3						1	
Tha.ven	4	4		2	6	4	5	2	2	5	3	8	4	3	5	3	4	5	3	5		3	4	6	5
Vic.ame				1		3	2	2	1	2					2			3		8		5		7	2
Vio.adu	1	2	2	5	2	2	3	70	1		1	1	15	5	1	5	1	1		2	3	2	1	3	4
Ziz.apt											1	1	1												
Ame.aln	6		10				3			2						1		20	50						
Arc.uva					3																				
Bet.spp			30		3		5	25	7	2	9		30	67									8		
Cor.cor												9		2		1									
Pop.tre	65	80	50	25	70	50	20	30	65	40	70	30	15	50	40	65	65	30	35	12	10	70	70	30	
Ros.aci	2			9	8	2	1	2			3				5		3	1		3	10	5	10	7	
Sal.beb			12		5		15	10		4			3	1				5	2						
litter	70	90	95	90	70	89	95	90	85	80	95	85	85	92	85	85	85	90	95	65	70	35	80	30	60
rock	7	1	2	2		3	2	2	2	3		1		1	1	1	1	1	1			1	1		
bareground																									1

2010.3111	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**

Ach.ric					4																				
Bro.spp	3				3	3	1	8		1		5				2						3			1
Cal.can																3									
Cal.spp	10	5	2	4	4	4	7	7	5	9	4	6	10	7	4	12	3	4	3	10	5	2	4	3	3
Car.spp			4	8	2		2					4	2		10		1		1	1			6	2	
Ely.spp	3	2		1	3		2	1	5	10	2	3		3	2		2	1	4	4		1		2	4
Ely.vil		1	1				1					2	1		1			6	4			2	6	1	
Fes.hal	5	1		4	5				2	4			2		3				1	3				1	7
Hel.hoo				1																					
Hie.odo				2							1				1										
Koe.mac	2			2	1		1			1				1	1										
Ach.mil	5	3		2	4	1	5	4	2	5	5	6	2	4	5	10	3	4	10	7		1	1	7	4
Aga.foe				2								5					2			1	2				9
Ago.gla	2			3	2	1				3	4			1	3								2		
Art.lud											12														
Cam.rot	1	1		1	1		1		1	1	1	1	1		1	1	1		1	1		1	1	1	1
Cir.arv																							2		
Com.pal	2			3	9			3	2	5	2	5	6		3			1	7	5			1		7
Epi.ang																					70	9	4	6	
Fra.vir	14	3	3	10	21	6	20		3	25	18	4	6	6	40	5	4		30	30		15	6	8	12
Gal.bor	8	7	5	4	6	5	4	10	8	8	6	13	6	8	22	20	5	1	6	6		4	8	3	8
Gen.aff				1			2																		
Geu.ale									3														1		
Geu.tri	1																								
Hed.alp	7			7	9		2	4	3	7		5	3	6	10	3	8	4	1	10		7	12		
Heu.ric							1	2																	
Hie.spp						2	3				2			2									1		
Lat.och	12	9	6	11	4	9	7	17	19	15	4	20	24	8	12	28	17	7	17	6	2	10	9	5	17
Lil.phi							1	1					2							1			1		
Mai.can			2																						
Mai.ste													4	3		4		2	2			2		2	2
Pol.sen	3			1	2					2										1					
Pot.arg			1	2		2	3																		
Pre.rac				1																					
Sis.mon					1																				
Sol.can		8	8			16	8	3	20	8	30		14			14	20	16	18	4	2	14	11	30	10
Sym.cil					20		7		4														1		
Sym.lae	11			7	6	6	6		2	12		3	14	2	10	3	3	3		1		7	12		7
Tar.off																						2	1		
Tha.ven	6	7	7	6	9	4	10	10	10	8	3	20	9	8	3	8	15	13	3	9	15	17	18	16	6
Vic.ame	8	7	15	6	8	20	7	15	20	11	10	18	8	8	11	15	2	15	16	11	35	11	25	10	11
Vio.adu	2	1	1	1	3	2	1	1	3	1	1	1	1	2	3	1	1	2	1	2		3	3	2	2
Ziz.apt	3			1				2	1													1			
Zyg.ele							3																		1
Ame.aln	9	5	7			4	6	2	2	9	2	3	12	6			5	4		8	2	2		6	2
Bet.spp	1	50	7	3		3		5				15						2		5	1				
Lon.dio				3		3	2	8					12	10				4					8		5
Pop.tre	10	2	8	6	11	3	13	3	15	27	11	10	20	30	26	32	10	6	70	25	10	23	15	20	24
Ros.aci	5	16	12	5	5	7	12	29	6	3	7	50	7	28	9	10	60	25	15	15	10	9	13	10	12
Sal.beb			10			30	6	21	48					15				15			45	21	15	12	5
Sym.occ				2		3	3	4				8				5	3		4	3	6		10		6
litter	35	30	25	25	23	20	15	20	35	40	55	20	35	20	3	30	20	5	18	30	50	20	15		38
rock				1						1	1												2		
bareground	2	2	3	3	2	5	4	2	1			1	1	6	2	2	8	10	5	2		5	3	7	2

2010.3112	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric										7															
Bro.spp						4		4							7	2	5			1				2	
Cal.spp	5		7		3				2	3				4	8					3	1		1	4	4
Car.spp	6	1	1	11	5	20	25	2		2		25	6	5		15	4	2	6	3		2	1	3	2
Ely.spp	1							4						2	2					2				5	3
Ely.vil	7	7	2	2	7	6	15	15	6			4	7	4		8	5	2	6	6	1	1	2	5	5
Fes.hal										6				2	4				2	8					1
Hel.hoo																									2
Hie.odo						2				6				4	1										
Koe.mac										3															
Muh.spp					8				6																
Ory.spp										1							4								
Poa.spp					1				2																
Sch.pur				4									5	3											

Ach.mil			4		1				3	4	3			2	5		4		4	5		3	4	3	6
Aga.foe																						8	10		
Ago.gla										4					2					4					
Cam.rot				1	1				1	2				1					1						
Cir.arv							2																		
Com.pal									2	3					3					1					
Epi.ang		3		4	7	8		4	2		4	4	15	7		9	9	12	4				4	10	4
Fra.vir	7	10	9		2	13	8	6		25	6	3	4		6	4	8		4	18	4	25	4	4	7
Gal.bor	10	20	6	12	5	5	5	8	5	12	4	5		6	8		12	1	8	5	8	7	6	10	10
Gen.aff														1											
Geu.ale		3	7													4							2		
Hed.alp			2									4				3	10		3		8	13	5		
Heu.ric														2					2						
Lat.och	10	5	4	26	7		8	14	12	7			12	5	6	9	7		4	6	13	7	7	27	7
Lil.phi										2															
Lit.can																				1					
Mai.can		2				1	2	2					3												
Mai.ste				2	4					1											1				
Pot.arg									3	5					2				5	3					
Pre.rac														1											
Sol.can	20		15	17		19			26	15	20			14	12	15	17		14	13	6	50	28	26	6
Son.spp		5					4																		
Sym.cil	65	20	25	5	6	7	5	8	8		4	6		3	3		5	5	5	6			4	6	7
Sym.lae		4		3					4	10	10			2	13	10		2	3	13				4	6
Tar.off																			3					5	
Tha.ven	13		16	16	18	16	8	7	18	18	25	7	13	13	8	18	8	3	15	6	7	4	5	12	7
Vic.ame	4	22	17	11	12	26	17	24	16	10	14	15	22	4	8	30	11	13		4	7	8	11	26	13
Vio.adu	2			4				3		2					3					3				2	1
Ziz.apt																				1			1		1
Ame.aln	4					9		3	2												2	2			
Arc.uva															4										
Bet.spp		3		8	4			4	1			85	11	7		3		40	2			2	5	3	
Lon.dio				14			5							8	4		3		5	4					25
Pop.tre	50	10	18	13	7	13	6	9	2	9	18	8	25	10	5	15	30	8	12	7	3	20	7	5	16
Ros.aci	15	28	32	9	13	25	10	25	4	10	10	7		5	5	40	35	4	5	4	6	5	20	3	10
Rub.spp		8					6																		
Sal.beb				14	35	5	60	13	2			11	10	26					13	3	85		18		50
Sym.occ		2									4	6	5		2			5				5	1		8
Vac.cae																				4					
litter	85	50	88	85	82	90	88	90	85	40	90	85	89	85	50	90	85	93	75	55	90	90	90	90	82
rock	2	1	3	3	2	2	2	2	2	2	1	1	2	1	1	1	1	1	2	3	1		1		1
bareground		25			2					2											2				

2010.3211	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Bro.spp			2		5	2		6	5	2	7	2		2	5	2	3	4		7					
Cal.can				3	4									55	2										
Cal.spp	8	4	9	2	6	7	3	12	15	1	2		6	10	4	3	7	8	2	6	3	3	8	4	25
Car.spp	2	1				4					1	4	4				1		7	3	3				
Ely.spp			4	3	5	1		2	2	15	3	1	1	4	8	1	4	7	3	2	1	1		4	4
Ely.vil	1	2				2					1			3		1	4	2			2	3	4	3	4
Fes.hal			2		2								1					3							6
Hel.hoo							5			2	2	3					1							2	
Hie.odo											4	2	1			1									
Koe.mac						1	1			1							1								
Ory.spp	4	3		2		3	6			3	4				2	2	4		3		1	2	3	2	
Poa.spp			1							1				1				1							
Ach.mil	3	1	3	6	4	1	1	2	1	1	7	2	1	7	6	1	7	2		1	2	3		5	9
Ago.gla				2																					
Ane.mul																						1			
Cam.rot	1	1	1	1	1	1			1															1	1
Cir.fol														9											
Com.pal																									2
Epi.ang	7	4		5	17	9	11	10	39	15	16	10	8		3	6	4		2	3	6	3	3	6	
Fra.vir	4	7	15		9	15	5	2	1	3	4	1	4	7	5	2	6	9	6	5	2		5	3	6
Gal.bor	2	5	17	7	6	4	6	10	6	6	9	13	8	12	8	9	4	15	9	7	3	9	12	12	20
Gen.aff			1	1																					
Geu.ale	3		2					2																	
Hed.alp	6	5		3	4	2		7						8			7	3	5	8		3	12	3	
Hie.spp					2		2	3												1			4	1	
Lat.och	8	30	19	13	20	8	13	15	15	25	22	17	16	5	7	16	20	15	18	15	8	17	10	13	25

Lil.phi	1							1								1						2		1	
Mai.can	1	4		1			6	3		1	1	2				4		1	3		2	2	3	3	1
Mai.ste			4	4			1	2																1	
Pot.arg					8							3													
Pre.rac	1				2																				
Sol.can	17	15	18	8	12	15	1	7	7		9	7	3	3	18	2	13	15	4	7	4	2	3	12	2
Sym.cil					3				5	10		5	7		7		10	4	5		3	4	7	10	3
Sym.lae	9	6	29	5	10	3	2	9	4	3	2	6	10	6	5	2		5	4		3	3	2		14
Tar.off																					1				
Tha.ven	11	30	2	15	30	7	20	15	13	7	32	19	15	10	4	8	12	10	18	12	4	8	20	17	6
Vic.ame	8	19	15	17	18	10	25	15	23	12	13	31	22	6	13	15	14	14	50	30	10	25	27	16	14
Vio.adu	2	2	4	3	1	2	5	2	4	1	1	1	1	1	2	2	3	2	2	1	1	1	2	1	1
Ziz.apt	2		1			1					1									2			2		3
Ame.aln	7		2	3	4	3	4	4		3	5		3							4			3		
Bet.spp	10	20				2	30		18	28	7	40	7			6	7	8	13		8	14	80	35	2
Lon.dio																15						18			
Pop.tre	5	8	8	5	12		1	14		4	7	7	2	12	26	7	15	16	8	12	12	20	10	13	17
Ros.aci	2	12	6	15	5	15	8	11	3	7	5	5	6	7	11	10		4	20	25	15				4
Sal.beb		4	40		12		25	31	5	15	50	18	35	6	1	33		1	70	10	70				
Sym.occ							4	4	2	2	6	8	3	6		6		9	7						5
litter	65	80	55	70	50	40	70	40	30	40	25	30	40	70	20	35	37	30	55	19	20	18	15	25	65
rock			1	1	1	1	2	2									1								
bareground	2		1	2	4	3	4	7	2	2	4	1	1		6	2	1	5	5	6	7	6	15	4	1

2010.3212	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ach.ric											3	3									3				
Agr.sca																						1			
Bro.spp				2																					
Cal.spp	5	2	12			9	13			2	7	8	15	1	2	3		2	3	1	8	30	11	15	2
Car.spp	4			2		1		5	2		2	1	2	1	3				2		4		1		
Ely.spp	10	29	1		3	6	3			1	7	4				6	50	2	12		11	25	5		1
Ely.vil		4	4		2			2	4	3			1		7	4		16	6		4	5	10	20	4
Fes.hal	7	6	1				2				6	3	8			7	2		11		5		4		
Fes.sax																1									
Hel.hoo					3																				
Hes.spp						5																			
Hie.odo						3					3	3			3										
Koe.mac																		5							
Ory.spp				9										8											
Sch.pur										5															
Ach.mil	6	3	2			10	6	1		4	5	2	11			5	9	4	5		5	5	7		4
Ago.gla							6				3						3								
Cam.rot	1	1	1		1	1	1			1	1		1			1	1		1			1	1	1	
Com.pal	2					2	3										2						1		
Epi.ang			10	10	7		4	12	12				4	15	4										
Eri.spp						2	1																		
Fra.vir	5	7	3	3	8	12	13			9	18	25	10	7	1	25		4	20		18	20	15	9	7
Gal.bor	14	10	4	1	4	5	8	4		7	8	6	7	8	10	6	6	6	4	3	8	8	8	8	2
Gen.aff						2																			
Hed.alp	3	3	5								5	2	3	11		6						4	4	6	
Heu.ric						2															1				
Hie.spp								14								2				1		2	4		
Lat.och	5	22	9	8	15	13	18	7	5	7	11	4	15	18	5		4	8	19	7	28	10	15	15	13
Lil.phi			1					1														1	2		
Lit.can	4	3				6	5				9	9	8						7		4				
Mai.can				2	1				2	1				20	9					3					
Mai.ste	4	1				3	4				4		2				2				2				
Pol.sen	3					4	3										3								
Pre.rac								1																	
Pyr.asa			2	2	2			6	2	1			3	4											
Sis.mon						1																			
Sol.can		11	4	7	9	2		5	5	15			5	4	7	15			2		2			20	
Sol.mis	2					9	28				7	2					11	3	11		2	5	2		
Sol.spa											8					3									
Sym.cil					25			3		4		4		10		8									
Sym.lae	10	11				8	10	5			11	5	11				6	5		2	7	10	8	6	1
Tha.ven	3	5	25	20	11	1	7	28	7		3	3	4	8	8	4	8	10	3	15	6	5	7	7	4
Vic.ame	4		8	10	13	4	11		16		7	6	13	16	25	7	7	17	2	12	14	9	15	28	45
Vio.adu	1	1	1			3	2	1			4	5	4			4	9	5	2		6	7	5		
Ziz.apt		2									3					2		2					1	3	

Zyg.ele		2														2									
Ame.aln	5	4	3	9	3	4	3		5	4		1	5	5					6	3		8		10	
Arc.uva	4										9	3					10		3						
Bet.spp		8	48	8	5			25	90			50			25			50		50					25
Lon.dio			2		2																				
Pop.tre	12	4	16	14	4	20	20	6	5	16	28	3	14	7	15	5	9	4	11	16	13	15	25	7	20
Ros.aci	3	7		4	12	5	4		6	16	7				13		3	10	10	4	4	4			6
Sal.beb	1	15		7	22			2		8				60	25	25					1				15
Sym.occ			6	3	10					3	1														
litter	40	60	85	65	90	55	65	50	90	65	45	30	55	85	85	65	70	70	55	85	60	40	60	70	80
rock	1	1	2			1		3	2	1		1	1	1	2	1		2	2	1		1			1
bareground				6		1		10		3	2	2					1				5	1		1	

8. Appendix C. Woody species mean plot cover and density

Table 8-1. Mean density of trembling aspen (pop.tre), saskatoon (ame.aln), Bebb's willow (sal.beb) and bog birch (bet.gla) in each forest transition community plot during the prescribed burn study in Prince Albert National Park, 1975-2010. Density of trembling aspen and saskatoon was the count of individual stems, and density of Bebb's willow and bog birch was the count of clumps. Season indicates either fall (f) or spring(s) burning, and Number of burns indicates the number of burns (3, 4 or 5) each plot was subjected to.

Year	Plot	Season	Number of burns	pop.tre	bet.gla	sal.beb	ame.aln
1975	1172	f	5	13.60	0.00	0.00	0.00
1975	1182	f	5	9.00	0.00	0.00	0.00
1975	1272	f	3	3.40	0.00	0.20	5.40
1975	1282	f	3	13.40	0.00	0.00	0.00
1975	2172	s	4	6.20	0.00	0.30	6.20
1975	2182	s	4	5.00	0.10	0.00	0.00
1975	2272	s	4	2.50	0.50	0.20	0.80
1975	2282	s	4	7.10	0.70	0.70	0.00
1975	2112	s	4	6.10	0.00	0.04	0.00
1975	2212	f	4	11.20	0.10	0.30	0.00
1975	3112	f	4	9.30	1.90	2.20	1.60
1975	3212	s	4	4.60	3.00	1.40	6.40
1983	1172	f	5	16.70	0.00	0.40	3.40
1983	1182	f	5	9.80	0.00	0.10	6.10
1983	1272	f	3	4.80	0.00	0.00	14.30
1983	1282	f	3	5.50	0.00	0.10	20.20
1983	2172	s	4	27.80	0.00	0.30	7.50
1983	2182	s	4	16.90	0.20	0.10	2.50
1983	2272	s	4	8.20	0.40	0.10	0.90
1983	2282	s	4	36.60	2.50	0.40	4.80
1983	2112	s	4	7.50	0.00	0.10	0.00
1983	2212	f	4	8.40	0.20	0.40	0.00
1983	3112	f	4	10.90	1.90	1.80	3.90
1983	3212	s	4	4.70	1.50	0.40	14.90
1995	1172	f	5	8.44	0.00	0.60	5.12
1995	1182	f	5	8.00	0.00	0.04	5.24
1995	1272	f	3	3.44	0.00	0.08	5.88
1995	1282	f	3	3.20	0.00	0.16	14.20
1995	2172	s	4	8.52	0.00	0.12	4.32
1995	2182	s	4	6.12	0.28	0.04	2.32

1995	2272	s	4	4.52	0.92	0.08	2.64
1995	2282	s	4	10.60	0.68	0.60	7.48
1995	2112	s	4	5.04	0.00	0.04	5.20
1995	2212	f	4	7.88	0.20	0.36	7.92
1995	3112	f	4	4.84	3.04	2.12	3.20
1995	3212	s	4	3.32	2.52	0.72	10.48
2010	1172	f	5	5.96	0.00	0.44	3.16
2010	1182	f	5	3.80	0.00	0.08	3.68
2010	1272	f	3	1.00	0.00	0.04	4.64
2010	1282	f	3	1.52	0.00	0.12	5.64
2010	2172	s	4	3.68	0.00	0.16	4.08
2010	2182	s	4	4.00	0.44	0.08	1.80
2010	2272	s	4	2.44	0.72	0.04	1.68
2010	2282	s	4	3.32	1.48	0.68	2.80
2010	2112	s	4	2.12	0.00	0.20	0.04
2010	2212	f	4	3.12	0.40	0.44	0.00

Table 8-2. Mean cover of trembling aspen (pop.tre), saskatoon (ame.aln), Bebb's willow (sal.beb) and bog birch (bet.gla) in each forest transition and grassland community plot during the prescribed burn study in Prince Albert National Park, 1975-2010. Season indicates either fall (f) or spring(s), and Number of burns indicates the number of burns (3, 4 or 5) each plot was subjected to. Grassland plots are indicated by plot numbers ending in '1' and forest transition plots are indicated by plot numbers ending in '2'.

Year	Plot	Season	Number of burns	pop.tre	bet.gla	ame.aln	sal.beb
1975	1171	c	5	0.40	0.00	0.00	0.00
1975	1172	c	5	5.08	0.00	0.00	0.00
1975	1181	c	5	1.48	0.00	0.00	0.00
1975	1182	c	5	9.52	0.00	0.00	0.00
1975	1271	c	3	2.88	0.00	0.00	0.00
1975	1272	c	3	7.76	0.00	0.00	0.00
1975	1281	c	3	2.08	0.00	0.00	0.00
1975	1282	c	3	13.20	0.00	0.00	0.00
1975	2171	c	4	2.28	0.00	0.00	0.00
1975	2172	c	4	3.00	0.00	0.00	2.04
1975	2181	c	4	1.20	0.00	0.00	0.00
1975	2182	c	4	1.40	3.44	0.00	0.64
1975	2271	c	4	2.08	0.00	0.00	0.00
1975	2272	c	4	1.80	0.60	0.00	0.00
1975	2281	c	4	0.00	0.00	0.00	0.00
1975	2282	c	4	2.20	0.60	0.00	0.40
1975	2112	c	4	3.20	0.00	0.00	0.00
1975	2212	c	4	4.78	2.68	0.52	1.18
1975	3111	c	4	2.80	3.20	0.00	1.40
1975	3112	c	4	4.20	1.80	0.00	1.80
1975	3211	c	4	3.20	2.40	0.00	1.20
1975	3212	c	4	2.80	3.20	0.00	1.40
1983	1171	f	5	0.60	0.00	2.88	0.00
1983	1172	f	5	9.32	0.00	1.60	0.20
1983	1181	f	5	0.20	0.00	0.40	0.00
1983	1182	f	5	3.24	0.00	0.60	0.00
1983	1271	f	3	0.00	0.00	4.12	0.00
1983	1272	f	3	3.04	0.00	2.92	0.00
1983	1281	f	3	1.68	0.00	1.68	0.00
1983	1282	f	3	3.64	0.00	2.88	0.00
1983	2171	s	4	0.60	0.00	1.84	0.00
1983	2172	s	4	6.04	0.00	1.40	1.84
1983	2181	s	4	2.04	0.00	0.00	0.00
1983	2182	s	4	7.68	0.84	0.40	0.20

1983	2271	s	4	0.00	0.00	3.28	0.00
1983	2272	s	4	4.88	3.32	0.80	0.20
1983	2281	s	4	0.80	0.00	0.20	0.00
1983	2282	s	4	11.80	2.68	1.64	0.60
1983	2112	s	4	6.64	0.00	0.00	0.00
1983	2212	f	4	5.28	0.20	0.00	3.08
1983	3111	f	4	3.04	11.04	3.20	1.48
1983	3112	f	4	8.32	9.28	1.40	8.00
1983	3211	s	4	4.28	18.44	5.80	7.24
1983	3212	s	4	3.04	11.04	3.20	1.48
1995	1171	f	5	0.84	0.00	4.40	0.00
1995	1172	f	5	18.44	0.00	7.88	0.00
1995	1181	f	5	0.20	0.00	1.48	0.00
1995	1182	f	5	9.12	0.00	0.80	0.00
1995	1271	f	3	0.20	0.00	6.04	0.00
1995	1272	f	3	6.44	0.00	1.88	0.00
1995	1281	f	3	2.88	0.00	2.72	0.00
1995	1282	f	3	12.32	0.00	5.00	0.00
1995	2171	s	4	0.00	0.00	6.00	0.64
1995	2172	s	4	1.24	0.00	3.72	1.68
1995	2181	s	4	0.00	0.00	0.00	0.00
1995	2182	s	4	2.08	3.28	1.28	1.44
1995	2271	s	4	0.00	0.00	3.12	0.20
1995	2272	s	4	3.24	6.72	2.12	0.00
1995	2281	s	4	0.00	0.20	0.20	0.20
1995	2282	s	4	2.48	3.76	4.24	3.16
1995	2112	s	4	7.08	0.00	0.00	0.00
1995	2212	f	4	3.68	1.92	0.20	4.08
1995	3111	f	4	4.16	17.00	6.88	4.16
1995	3112	f	4	20.76	17.60	4.56	8.08
1995	3211	s	4	5.76	23.36	5.40	4.76
1995	3212	s	4	4.16	17.00	6.88	4.16
2010	1171	f	5	2.04	0.00	4.96	0.20
2010	1172	f	5	37.40	0.00	3.72	5.60
2010	1181	f	5	4.96	0.00	1.60	0.00
2010	1182	f	5	20.44	0.00	1.84	0.20
2010	1271	f	3	0.64	0.00	4.36	0.00
2010	1272	f	3	2.84	0.00	2.28	0.20
2010	1281	f	3	2.88	0.00	2.28	0.00
2010	1282	f	3	27.36	0.00	4.32	0.20
2010	2171	s	4	7.60	0.00	3.08	2.24
2010	2172	s	4	25.20	0.00	3.08	1.28
2010	2181	s	4	7.44	0.00	0.00	0.00

2010	2182	s	4	34.12	3.68	3.68	1.04
2010	2271	s	4	0.60	0.00	2.88	0.00
2010	2272	s	4	33.36	6.16	0.80	0.40
2010	2281	s	4	11.08	3.48	0.60	2.08
2010	2282	s	4	41.32	6.96	3.48	2.68
2010	2112	s	4	42.60	0.00	0.00	5.80
2010	2212	f	4	49.52	3.92	0.00	11.08

9. Appendix D. Species-axis correlations

Table 9-1. Correlations coefficients (r) between all species and ordination axes of the NMS ordination using 2010 mean species cover in the grassland plant community plots (11 plots x 95 species).

Species	Axis 1	Axis 2	Axis 3
Achillea millefolium	-0.016	-0.652	0.019
Achnatherum richardsonii	-0.086	-0.111	-0.615
Agastache foeniculum	0.153	-0.289	-0.420
Agoseris glauca	-0.538	0.516	-0.772
Agrostis scabra	-0.360	0.412	-0.860
Allium spp.	-0.029	-0.234	-0.394
Amelanchier alnifolia	0.733	0.149	0.077
Androsace septentrionalis	-0.100	0.692	-0.094
Anemone canadensis	0.103	-0.502	-0.078
Anemone multifida	-0.462	0.325	-0.655
Antennaria spp.	-0.210	0.706	-0.449
Arctostaphylos uva-ursi	-0.759	0.785	-0.273
Arnica fulgens	0.068	0.100	-0.548
Artemisia campestris	0.034	-0.024	-0.534
Artemisia frigida	-0.757	0.063	-0.040
Artemisia ludoviciana	-0.500	-0.129	-0.473
Astragalus laxmannii	-0.685	0.288	-0.398
Betula spp.	0.331	-0.528	0.885
Bromus spp.	0.509	-0.536	0.950
Calamagrostis canadensis	0.368	-0.413	0.729
Calamagrostis rubescens	0.177	-0.068	-0.293
Calamagrostis spp.	-0.161	-0.111	0.443
Campanula rotundifolia	-0.281	-0.241	-0.349
Carex spp.	-0.246	0.705	-0.775
Cerastium arvense	-0.302	0.764	-0.196
Cirsium arvense	0.331	-0.269	0.510
Cirsium foliosum	0.122	-0.394	0.024
Coeloglossum viride	0.119	0.234	-0.132
Comandra umbellata	-0.123	0.583	-0.512
Danthonia intermedia	-0.504	-0.166	-0.366
Elymus lanceolatus	0.231	0.338	-0.475

Elymus spp.	-0.689	-0.076	-0.248
Elymus villosus	-0.475	-0.182	0.445
Epilobium angustifolium	0.394	-0.478	0.941
Erigeron spp.	-0.460	0.448	-0.891
Festuca hallii	-0.171	0.413	-0.749
Festuca saximontana	-0.049	0.710	-0.672
Fragaria virginiana	0.533	0.425	-0.043
Gaillardia aristata	-0.328	0.002	-0.465
Galium boreale	-0.162	0.510	0.125
Galium trifidum	-0.126	0.644	-0.229
Galium triflorum	0.278	-0.339	-0.028
Gentiana affinis	-0.095	-0.382	0.779
Geum aleppicum	0.193	-0.376	0.332
Geum triflorum	-0.356	0.032	-0.205
Hedysarum alpinum	-0.140	0.458	0.331
Helictotrichon hookerii	0.358	-0.261	0.796
Hesperostipa spp.	-0.365	0.009	-0.596
Heuchera richardsonii	-0.218	0.154	-0.647
Hierochloe odorata	-0.271	-0.169	-0.456
Hieracium spp.	-0.368	0.624	-0.198
Koeleria macrantha	0.045	-0.081	-0.501
Lathyrus ochroleucus	0.184	-0.445	0.967
Liatris ligulistylis	-0.154	0.001	-0.433
Lilium philadelphicum	0.484	-0.075	0.710
Lithospermum canescens	0.091	0.335	-0.565
Lonicera dioica	0.438	-0.425	0.848
Maianthemum canadense	0.291	-0.375	0.794
Maianthemum stellatum	-0.289	0.217	-0.397
Muhlenbergia spp.	0.095	-0.475	-0.397
Orthocarpus luteus	-0.228	-0.283	-0.514
Oryzopsis spp.	0.202	-0.353	0.756
Oxytropis campestris	-0.796	0.174	-0.587
Pascopyrum smithii	0.272	0.528	-0.439
Picea glauca	-0.167	0.394	-0.261
Pinus banksiana	-0.706	0.031	-0.051
Poa spp.	0.370	-0.277	0.551
Polygala senega	-0.433	0.707	-0.614
Populus tremuloides	0.260	-0.642	0.692
Potentilla arguta	0.118	-0.209	-0.612
Potentilla pensylvanica	-0.316	0.113	-0.294
Prenanthes racemosa	0.322	-0.200	0.708

Prunus virginiana	-0.306	0.333	-0.168
Pulsatilla patens	0.053	0.564	-0.638
Pyrola asarifolia	-0.100	0.692	-0.094
Rosa acicularis	0.632	-0.703	0.516
Salix bebbiana	0.443	-0.495	0.958
Schizachne purpurascens	0.217	0.538	-0.189
Selaginella densa	-0.475	0.086	-0.577
Sisyrinchium montanum	-0.339	0.542	-0.950
Solidago canadensis	0.526	-0.603	0.941
Solidago missouriensis	-0.652	0.534	-0.831
Solidago nemoralis	0.256	0.131	-0.256
Solidago rigida	-0.340	0.427	-0.405
Solidago spathulata	0.271	0.075	-0.072
Spiranthes romanzoffiana	0.150	0.184	-0.213
Symphyotrichum ciliolatum	0.601	-0.613	0.782
Symphyotrichum laeve	0.529	-0.418	0.446
Symphoricarpos occidentalis	0.668	-0.185	-0.098
Taraxacum officinale	-0.427	-0.236	-0.424
Thalictrum venulosum	0.357	-0.544	0.884
Vicia americana	0.416	-0.575	0.909
Viola adunca	-0.068	-0.375	0.420
Zizia aptera	-0.272	0.668	0.138
Zygadenus elegans	-0.248	0.617	-0.162

Table 9-2. Correlations coefficients (r) between all species and ordination axes of the NMS ordination using 1975, 1983, 1995 and 2010 mean species cover in the grassland plant community plots (44 plots x 115 species).

Species	Axis 1	Axis 2	Axis 3
Achillea millefolium	0.029	0.444	-0.217
Achnatherum richardsonii	-0.181	-0.005	-0.366
Agastache foeniculum	-0.159	0.113	-0.318
Agoseris glauca	-0.516	-0.178	-0.414
Agrostis scabra	0.238	-0.426	-0.480
Allium spp.	-0.095	0.099	-0.176
Amelanchier alnifolia	-0.301	0.437	0.030
Androsace septentrionalis	-0.188	-0.233	-0.397
Anemone canadensis	-0.039	-0.240	0.128
Anemone cylindrica	0.022	-0.275	-0.150
Anemone multifida	-0.419	-0.263	-0.369
Antennaria spp.	-0.375	-0.357	-0.137
Arabis hirsuta	0.160	-0.070	-0.256
Arctostaphylos uva-ursi	-0.463	-0.200	0.339
Arnica fulgens	-0.368	0.270	-0.210
Artemisia campestris	-0.222	0.102	-0.299
Artemisia frigida	0.280	-0.270	0.005
Artemisia ludoviciana	0.275	-0.300	-0.317
Astragalus laxmannii	-0.240	-0.222	-0.290
Betula spp.	0.011	0.600	0.411
Bromus spp.	0.057	0.256	0.684
Calamagrostis canadensis	-0.092	0.546	0.100
Calamagrostis rubescens	-0.164	0.157	-0.142
Calamagrostis spp.	-0.455	0.560	-0.237
Campanula rotundifolia	-0.235	0.073	-0.654
Carex spp.	-0.374	0.078	-0.516
Cerastium arvense	-0.095	-0.221	-0.469
Chenopodium album	-0.247	-0.115	0.032
Cirsium arvense	0.077	0.120	-0.151
Cirsium foliosum	-0.177	0.328	-0.062
Coeloglossum viride	-0.246	0.143	-0.045
Comandra umbellata	-0.375	0.168	-0.131
Crepis tectorum	-0.058	-0.189	0.202
Danthonia intermedia	-0.375	0.053	-0.231
Elymus lanceolatus	-0.302	0.211	-0.180
Elymus spp.	0.678	-0.367	0.017

Elymus villosus	0.180	-0.080	0.552
Epilobium angustifolium	-0.054	0.664	0.194
Erigeron spp.	-0.194	-0.276	-0.648
Festuca brachyphylla	-0.199	-0.109	-0.095
Festuca hallii	0.569	-0.558	-0.298
Festuca saximontana	-0.549	-0.032	-0.263
Fragaria virginiana	-0.395	0.621	0.057
Gaillardia aristata	-0.249	-0.107	-0.317
Galium boreale	-0.216	-0.205	-0.071
Galium trifidum	-0.191	0.234	-0.056
Galium triflorum	-0.064	0.193	-0.046
Gentiana affinis	-0.228	0.192	0.153
Gentianella amarella	0.085	0.239	-0.021
Geum aleppicum	-0.314	0.552	-0.040
Geum triflorum	0.165	-0.249	0.047
Hedysarum alpinum	-0.577	0.343	0.167
Helictotrichon hookerii	0.255	0.187	0.019
Hesperostipa spp.	0.048	-0.262	-0.473
Heuchera richardsonii	-0.444	0.088	-0.407
Hieracium spp.	-0.503	0.236	-0.371
Hierochloe odorata	-0.293	0.323	-0.254
Koeleria macrantha	0.362	-0.182	-0.495
Lathyrus ochroleucus	0.075	0.580	0.370
Lathyrus venosus	-0.146	0.113	0.016
Liatris ligulistylis	-0.233	0.097	-0.179
Lilium philadelphicum	-0.077	0.537	0.272
Lithospermum canescens	-0.459	0.303	-0.060
Lonicera dioica	-0.039	0.615	0.270
Lycopodium spp.	0.029	-0.060	0.044
Maianthemum canadense	0.035	0.632	0.285
Maianthemum stellatum	-0.270	0.236	-0.167
Monarda fistulosa	0.351	-0.119	-0.038
Muhlenbergia racemosa	-0.044	-0.074	-0.274
Muhlenbergia spp.	-0.131	0.090	-0.253
Mulgedium oblongifolium	0.381	-0.106	-0.048
Orthilia secunda	0.196	0.246	0.152
Orthocarpus luteus	-0.255	-0.166	-0.370
Oryzopsis spp.	0.014	0.362	0.187
Oxytropis campestris	-0.158	-0.489	-0.147
Pascopyrum smithii	-0.364	0.250	-0.151
Picea glauca	-0.364	0.128	-0.119

Pinus banksiana	-0.249	0.023	0.049
Poa spp.	0.606	-0.216	-0.090
Poaceae unknown	-0.247	-0.115	0.032
Polygala senega	-0.651	0.155	-0.264
Populus balsamifera	0.016	-0.038	0.200
Populus tremuloides	-0.161	0.729	0.218
Potentilla arguta	-0.364	0.322	-0.273
Potentilla pensylvanica	-0.150	-0.083	-0.232
Prenanthes racemosa	-0.208	0.554	0.068
Prunus virginiana	-0.199	0.017	-0.033
Pulsatilla patens	-0.482	0.182	-0.341
Pyrola asarifolia	-0.086	0.278	0.313
Rosa acicularis	-0.034	0.604	0.017
Salix bebbiana	-0.025	0.770	0.311
Schizachne purpurascens	-0.036	0.356	0.018
Selaginella densa	-0.418	0.235	-0.161
Shepherdia canadensis	-0.014	0.013	-0.090
Silene drummondii	-0.247	-0.115	0.032
Sisyrinchium montanum	-0.301	-0.027	-0.366
Solidago canadensis	-0.053	0.799	0.219
Solidago missouriensis	-0.312	-0.123	-0.662
Solidago nemoralis	-0.114	0.120	-0.121
Solidago rigida	0.083	0.123	0.697
Solidago spathulata	-0.073	-0.276	0.191
Sonchus spp.	0.628	-0.200	0.015
Spiranthes romanzoffiana	-0.188	0.161	-0.086
Sporobolus spp.	-0.186	0.142	0.094
Stellaria longifolia	-0.026	-0.322	-0.411
Symphoricarpos occidentalis	0.445	-0.042	-0.282
Symphyotrichum ciliolatum	0.006	0.583	0.097
Symphyotrichum laeve	-0.212	0.572	0.732
Taraxacum officinale	-0.356	0.391	0.003
Thalictrum venulosum	-0.027	0.595	-0.017
Vaccinium caespitosum	0.139	0.137	0.083
Vicia americana	0.509	0.289	0.026
Viola adunca	-0.698	0.422	-0.252
Zizia aptera	-0.300	0.502	0.105
Zygadenus elegans	-0.145	-0.129	-0.031

Table 9-3. Correlations coefficients (r) between all species and ordination axes of the NMS ordination using 2010 mean species cover in the forest transition plant community plots (13 plots x 113 species).

Species	Axis 1	Axis 2	Axis 3
Achillea millefolium	-0.903	0.455	0.248
Achnatherum richardsonii	-0.522	0.348	0.514
Agastache foeniculum	0.747	-0.169	0.142
Agoseris glauca	-0.447	0.401	0.683
Agrostis scabra	-0.230	0.440	0.708
Allium spp.	-0.343	0.249	0.602
Amelanchier alnifolia	0.752	-0.330	0.375
Amerorchis rotundifolia	0.019	0.143	0.231
Anemone multifida	-0.333	0.544	0.669
Antennaria spp.	-0.201	0.297	0.396
Apocynum androsaemifolium	0.795	-0.441	0.227
Arabis hirsuta	0.134	0.246	-0.141
Aralia nudicaulis	0.795	-0.441	0.227
Arctostaphylos uva-ursi	-0.548	0.468	0.713
Arnica fulgens	0.177	0.132	-0.057
Artemisia campestris	-0.497	0.336	0.687
Artemisia ludoviciana	0.227	0.133	0.126
Betula spp.	0.044	-0.557	-0.234
Botrychium virginianum	0.161	0.071	-0.300
Bromus inermis	-0.133	0.098	-0.528
Bromus spp.	0.172	0.064	-0.876
Calamagrostis canadensis	0.327	0.067	-0.300
Calamagrostis rubescens	-0.020	0.239	-0.487
Calamagrostis spp.	-0.550	0.160	0.054
Campanula rotundifolia	-0.725	0.367	0.630
Carex spp.	-0.001	-0.303	-0.019
Castilleja miniata	-0.090	0.107	-0.062
Cerastium arvense	0.134	0.246	-0.141
Cirsium arvense	-0.145	-0.671	-0.111
Cirsium foliosum	0.539	0.114	-0.117
Coeloglossum viride	-0.195	0.288	0.437
Comandra umbellata	-0.664	0.284	0.743
Cornus canadensis	-0.017	0.160	0.187
Corylus cornuta	0.819	-0.439	0.160
Danthonia intermedia	-0.080	0.545	0.255

Disporum trachycarpum	0.795	-0.441	0.227
Elymus spp.	-0.488	0.265	0.660
Elymus villosus	-0.107	0.176	-0.682
Epilobium angustifolium	0.063	-0.582	-0.504
Erigeron spp.	-0.265	0.568	0.587
Festuca hallii	-0.492	0.487	0.599
Festuca saximontana	-0.245	0.310	0.578
Fragaria virginiana	-0.390	0.117	0.561
Gaillardia aristata	0.480	0.122	0.233
Galium boreale	-0.296	-0.008	0.707
Gentiana affinis	0.002	-0.376	-0.251
Geum aleppicum	-0.003	-0.487	0.089
Geum triflorum	0.474	0.120	-0.079
Hedysarum alpinum	-0.624	0.294	0.237
Helictotrichon hookerii	-0.006	0.270	-0.152
Hesperostipa spp.	-0.263	0.459	0.608
Heuchera richardsonii	-0.324	0.567	0.254
Hierochloe odorata	-0.334	0.339	0.619
Hieracium spp.	-0.340	0.438	0.468
Koeleria macrantha	-0.515	0.344	0.712
Lathyrus ochroleucus	-0.412	-0.188	-0.519
Lathyrus venosus	0.793	-0.438	0.225
Liatris ligulistylis	-0.239	0.350	0.512
Lilium philadelphicum	-0.202	-0.101	0.015
Lithospermum canescens	-0.532	0.387	0.544
Lonicera dioica	0.173	-0.819	0.020
Lycopodium spp.	0.245	0.158	-0.284
Lysimachia ciliata	0.795	-0.441	0.227
Maianthemum canadense	0.399	-0.630	0.218
Maianthemum stellatum	0.205	0.378	-0.386
Mertensia paniculata	0.469	-0.269	-0.215
Mitella nuda	0.043	0.060	-0.560
Muhlenbergia spp.	0.781	-0.391	-0.027
Orthocarpus luteus	0.002	0.274	0.269
Oryzopsis spp.	0.762	-0.349	0.178
Oxytropis campestris	-0.454	0.553	0.687
Pascopyrum smithii	0.177	0.132	-0.057
Petasites frigidus	0.795	-0.441	0.227
Picea glauca	-0.343	0.249	0.602
Pinus banksiana	-0.273	0.323	0.546
Poa spp.	-0.145	-0.671	-0.111

Polygala senega	-0.540	0.548	0.680
Populus tremuloides	0.168	0.405	-0.841
Potentilla arguta	-0.160	0.265	0.110
Potentilla pensylvanica	0.177	0.132	-0.057
Prenanthes racemosa	0.190	-0.802	0.090
Prunus pensylvanica	0.795	-0.441	0.227
Prunus virginiana	0.795	-0.441	0.227
Pulsatilla patens	-0.301	0.394	0.501
Pyrola asarifolia	0.528	-0.538	0.051
Rosa acicularis	-0.156	-0.081	-0.119
Rubus pubescens	0.795	-0.441	0.227
Rubus spp.	0.422	0.082	-0.005
Salix bebbiana	-0.297	-0.609	-0.556
Schizachne purpurascens	0.120	0.077	-0.693
Selaginella densa	-0.049	0.302	0.350
Shepherdia canadensis	-0.080	0.237	0.125
Sisyrinchium montanum	-0.342	0.568	0.726
Solidago canadensis	0.021	-0.736	-0.379
Solidago missouriensis	-0.479	0.353	0.753
Solidago rigida	-0.327	0.249	0.227
Solidago spathulata	-0.255	0.061	0.106
Sonchus spp.	0.020	-0.133	-0.366
Spiranthes romanzoffiana	-0.017	0.160	0.187
Symphyotrichum ciliolatum	-0.191	-0.707	-0.070
Symphyotrichum laeve	-0.499	0.449	0.704
Symphoricarpos occidentalis	0.734	-0.365	0.371
Taraxacum officinale	0.454	0.506	-0.202
Thalictrum venulosum	-0.474	-0.454	-0.384
Trifolium pratense	0.177	0.132	-0.057
Trifolium repens	0.177	0.132	-0.057
Vaccinium caespitosum	0.327	-0.323	-0.083
Vaccinium myrtilloides	-0.017	0.160	0.187
Vicia americana	-0.415	-0.733	0.073
Viola adunca	-0.207	0.715	0.006
Viola canadensis	0.795	-0.441	0.227
Zizia aptera	-0.590	-0.150	-0.044
Zygadenus elegans	-0.410	0.193	0.419

Table 9-4. Correlations coefficients (r) between all species and ordination axes of the NMS ordination using 1975, 1983, 1995 and 2010 mean species cover in the forest transition plant community plots (52 plots x 131 species).

Species	Axis 1	Axis 2	Axis 3
Achillea millefolium	0.541	0.312	0.009
Achnatherum richardsonii	0.469	0.167	-0.095
Agastache foeniculum	-0.270	-0.032	0.238
Agoseris glauca	0.191	0.506	-0.211
Agrimonia striata	-0.015	0.048	0.151
Agrostis scabra	-0.238	0.198	-0.587
Allium spp.	-0.013	0.196	-0.067
Amelanchier alnifolia	-0.224	0.049	0.492
Amerorchis rotundifolia	-0.105	0.008	0.263
Androsace septentrionalis	0.225	0.287	-0.064
Anemone canadensis	-0.426	0.191	-0.125
Anemone cylindrica	0.020	0.342	-0.250
Anemone multifida	-0.016	0.486	-0.120
Antennaria spp.	0.015	0.402	0.049
Apocynum androsaemifolium	-0.209	0.006	0.300
Arabis hirsuta	0.112	0.026	0.143
Aralia nudicaulis	-0.209	0.006	0.300
Arctostaphylos uva-ursi	-0.152	0.571	-0.281
Arnica fulgens	0.022	-0.025	0.136
Artemisia campestris	0.034	0.412	-0.083
Artemisia ludoviciana	-0.008	0.060	-0.132
Astragalus laxmannii	0.038	0.123	-0.075
Betula spp.	0.189	-0.213	0.287
Botrychium virginianum	0.083	-0.090	0.269
Bromus inermis	0.106	-0.128	0.326
Bromus spp.	-0.457	-0.623	-0.284
Calamagrostis canadensis	-0.027	-0.060	0.500
Calamagrostis rubescens	0.075	-0.130	0.325
Calamagrostis spp.	0.448	0.322	0.530
Campanula rotundifolia	0.392	0.669	-0.059
Carex spp.	0.529	0.336	0.159
Castilleja miniata	-0.015	0.013	0.185
Cerastium arvense	0.217	0.378	-0.066
Chenopodium album	0.183	-0.115	-0.097
Cirsium arvense	0.234	-0.177	0.137

Cirsium foliosum	0.020	-0.135	0.329
Coeloglossum viride	-0.010	0.232	0.188
Comandra umbellata	0.301	0.638	-0.196
Cornus canadensis	-0.139	0.005	-0.073
Corylus cornuta	-0.187	-0.012	0.346
Crepis tectorum	0.027	0.137	-0.148
Danthonia intermedia	0.357	0.190	0.051
Disporum trachycarpum	-0.209	0.006	0.300
Elymus spp.	-0.219	0.445	-0.546
Elymus villosus	0.188	-0.234	0.441
Epilobium angustifolium	0.447	-0.324	0.134
Erigeron spp.	0.070	0.459	-0.201
Festuca hallii	0.338	0.369	-0.519
Festuca saximontana	0.047	0.397	0.051
Fragaria virginiana	0.107	0.085	0.529
Gaillardia aristata	-0.041	0.205	0.228
Galium boreale	0.506	0.471	-0.051
Gentiana affinis	0.301	0.381	0.073
Gentianella amarella	0.209	0.046	-0.107
Geum aleppicum	-0.008	-0.128	0.401
Geum triflorum	-0.069	-0.259	-0.113
Hedysarum alpinum	0.234	0.356	0.203
Helictotrichon hookerii	0.028	-0.366	-0.153
Hesperostipa spp.	0.030	0.158	-0.481
Heterotheca villosa	0.009	0.116	-0.124
Heuchera richardsonii	0.366	0.032	0.043
Hieracium spp.	0.183	0.451	0.404
Hierochloe odorata	0.067	-0.093	-0.082
Koeleria macrantha	0.329	0.440	-0.236
Lathyrus ochroleucus	0.339	-0.233	0.532
Lathyrus venosus	-0.207	0.095	0.335
Liatris ligulistylis	0.182	0.223	0.046
Lilium philadelphicum	0.191	0.018	0.142
Lithospermum canescens	0.132	0.399	0.283
Lonicera dioica	-0.045	-0.148	0.449
Lycopodium spp.	0.009	-0.062	0.166
Lysimachia ciliata	-0.290	-0.059	0.290
Maianthemum canadense	-0.113	0.030	0.358
Maianthemum stellatum	0.432	-0.269	0.181
Mertensia paniculata	-0.075	-0.085	0.434
Mitella nuda	0.130	-0.146	0.384

Monarda fistulosa	-0.441	0.071	0.082
Muhlenbergia racemosa	0.362	0.187	-0.030
Muhlenbergia spp.	-0.127	-0.108	0.497
Mulgedium oblongifolium	0.110	0.001	-0.095
Orthilia secunda	-0.405	-0.540	-0.142
Orthocarpus luteus	0.193	0.408	0.039
Oryzopsis spp.	0.121	0.092	0.228
Oxytropis campestris	0.069	0.527	-0.337
Pascopyrum smithii	0.022	-0.025	0.136
Petasites frigidus	-0.209	0.006	0.300
Picea glauca	0.012	0.195	-0.005
Pinus banksiana	0.000	0.262	0.108
Poa spp.	0.258	-0.172	-0.326
Polygala senega	0.183	0.596	0.159
Populus balsamifera	0.149	-0.108	-0.100
Populus tremuloides	0.091	-0.071	0.748
Potentilla arguta	0.344	0.059	0.307
Potentilla pensylvanica	0.043	0.143	0.033
Prenanthes racemosa	0.160	0.019	0.363
Prunus pensylvanica	-0.209	0.006	0.300
Prunus virginiana	-0.435	-0.009	0.167
Pulsatilla patens	0.024	0.312	0.141
Pyrola asarifolia	0.025	-0.041	0.433
Ribes oxyacanthoides	0.044	-0.030	-0.019
Rosa acicularis	0.019	-0.137	0.344
Rubus pubescens	-0.220	0.016	0.116
Rubus spp.	-0.068	-0.022	0.379
Salix bebbiana	0.326	-0.286	0.501
Schizachne purpurascens	0.633	0.103	0.179
Selaginella densa	0.023	0.105	0.154
Shepherdia canadensis	0.062	0.090	0.151
Silene drummondii	0.009	0.116	-0.124
Sisyrinchium montanum	0.362	-0.260	-0.121
Solidago canadensis	0.441	-0.041	0.589
Solidago missouriensis	0.211	0.616	-0.065
Solidago rigida	-0.533	-0.487	-0.387
Solidago spathulata	0.260	-0.087	-0.208
Sonchus spp.	-0.039	0.035	0.059
Spiranthes romanzoffiana	-0.005	0.070	0.169
Sporobolus spp.	0.149	0.205	0.034
Stellaria longifolia	0.184	0.020	-0.036

Symphoricarpos occidentalis	-0.436	0.209	0.312
Symphyotrichum ciliolatum	0.310	0.031	0.319
Symphyotrichum laeve	-0.085	-0.133	0.034
Taraxacum officinale	-0.041	-0.233	0.405
Thalictrum venulosum	0.568	-0.096	0.326
Trifolium pratense	0.022	-0.025	0.136
Trifolium repens	0.022	-0.025	0.136
Vaccinium caespitosum	0.255	0.076	0.184
Vaccinium myrtilloides	-0.005	0.070	0.169
Vicia americana	0.145	0.062	0.300
Viola adunca	0.485	0.400	0.400
Viola canadensis	-0.209	0.006	0.300
Zizia aptera	0.444	0.231	0.261
Zygadenus elegans	-0.134	0.381	-0.255

10. Appendix E. Species ordinations

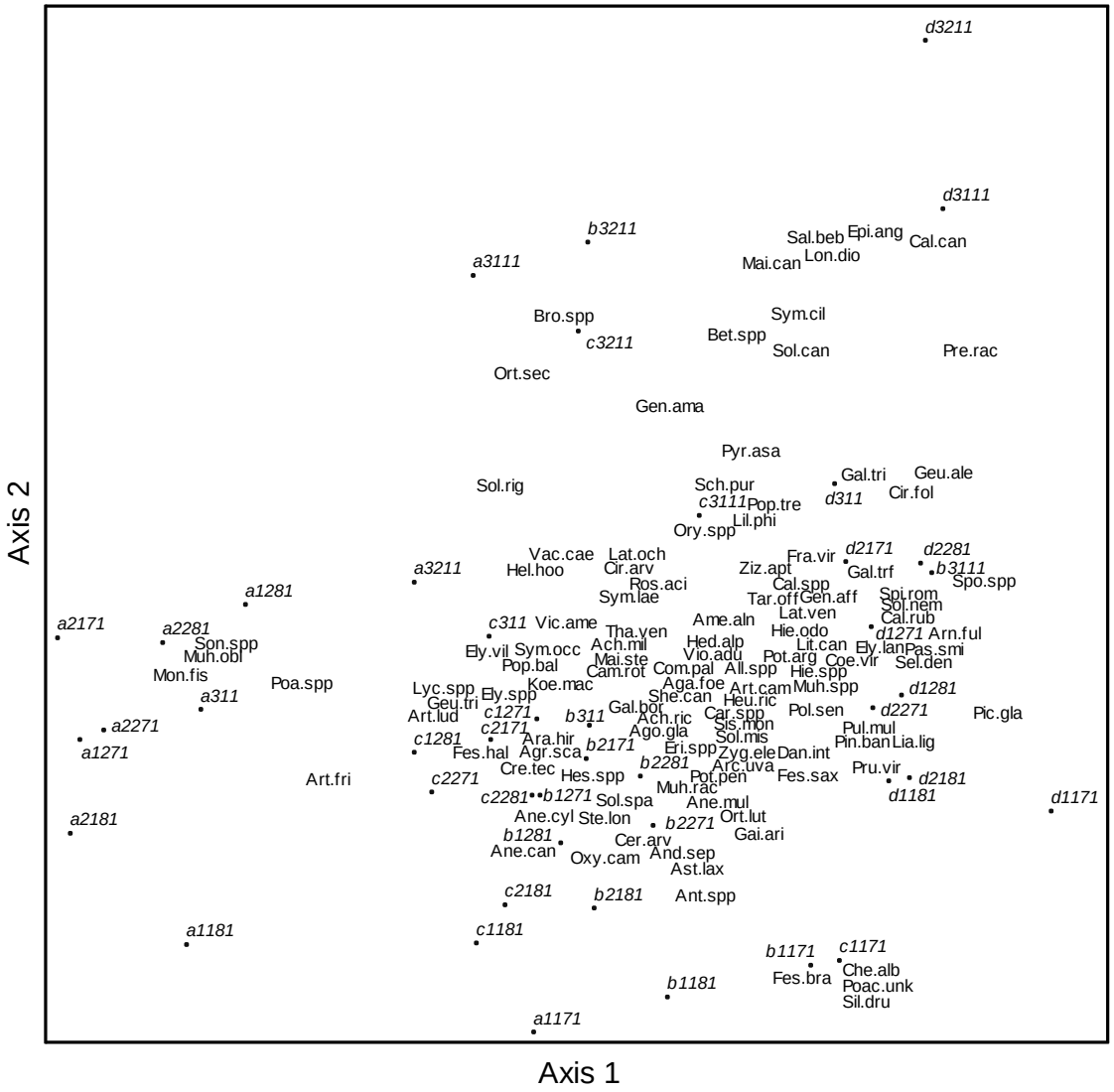

Figure 10-1. Three-dimensional ordination of plots in species space (44 plots x 115 species) using mean species cover in the grassland plant community plots from 1975, 1983, 1995 and 2010. Plot labels represent relative centroid of each plot, and species epithets represent the relative centroid of each species. Plot numbers beginning by 'a' indicate 1975 survey, 'b' indicate 1983 survey, 'c' indicate 1995, and 'd' indicate 2010. The ordination yielded a three-dimensional solution with a final stress of 12.86. Axis 1 accounted for 17.9% and Axis 2 accounted for 33.4% of variation in the distance matrix. Axis 3 accounted for 31.4% of variation in the distance matrix, and is shown in Fig. 10-2.

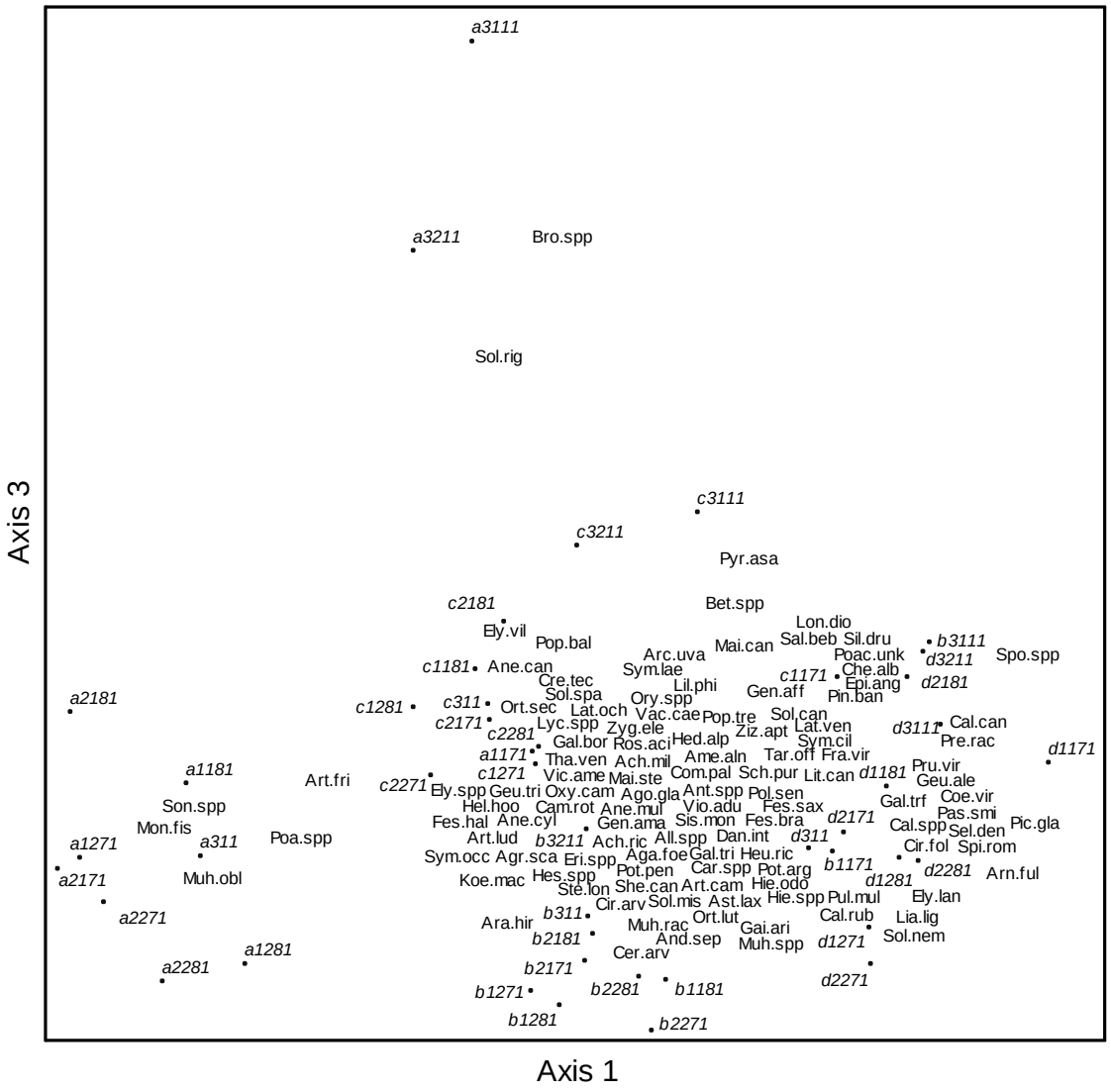

Figure 10-2. Three-dimensional ordination of plots in species space (44 plots x 115 species) using mean species cover in the grassland plant community plots from 1975, 1983, 1995 and 2010. Plot labels represent relative centroid of each plot, and species epithets represent the relative centroid of each species. Plot numbers beginning by 'a' indicate 1975 survey, 'b' indicate 1983 survey, 'c' indicate 1995, and 'd' indicate 2010. The ordination yielded a three-dimensional solution with a final stress of 12.86. Axis 1 accounted for 17.9% and Axis 3 accounted for 31.4% of variation in the distance matrix. Axis 2 accounted for 33.4% of variation in the distance matrix, and is shown in Fig. 10-1.

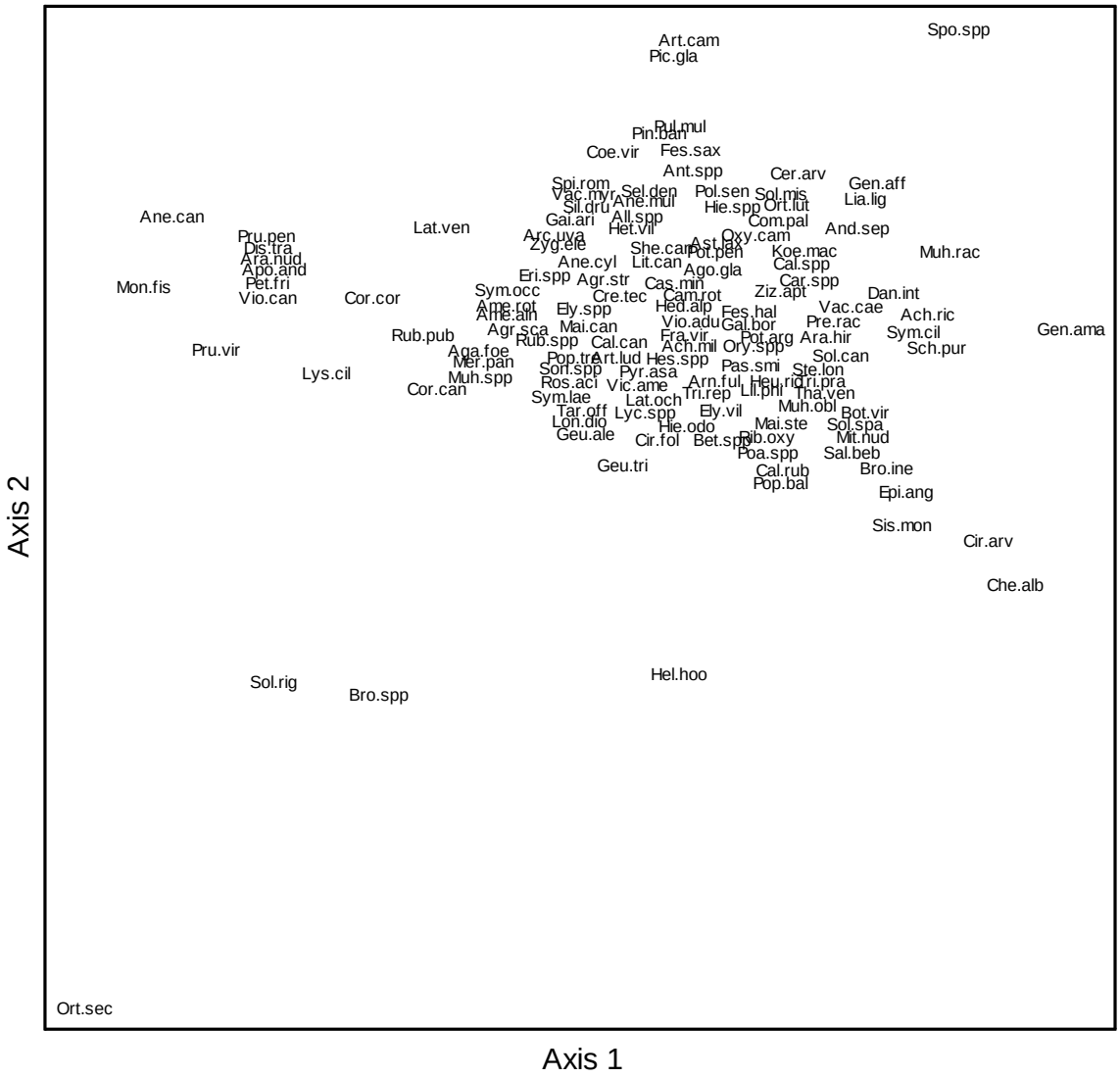

Figure 10-3. Three-dimensional ordination of plots in species space (52 plots x 131 species) using mean species cover in the forest transition plant community plots from 1975, 1983, 1995 and 2010. Plot labels represent relative centroid of each plot, and species epithets represent the relative centroid of each species. Plot numbers beginning by ‘a’ indicate 1975 survey, ‘b’ indicate 1983 survey, ‘c’ indicate 1995, and ‘d’ indicate 2010. The ordination yielded a three-dimensional solution with a final stress of 13.98. Axis 1 accounted for 27.4% and Axis 2 accounted for 23.5% of variation in the distance matrix. Axis 3 accounted for 33.0% of variation in the distance matrix, and is shown in Fig. 10-4.

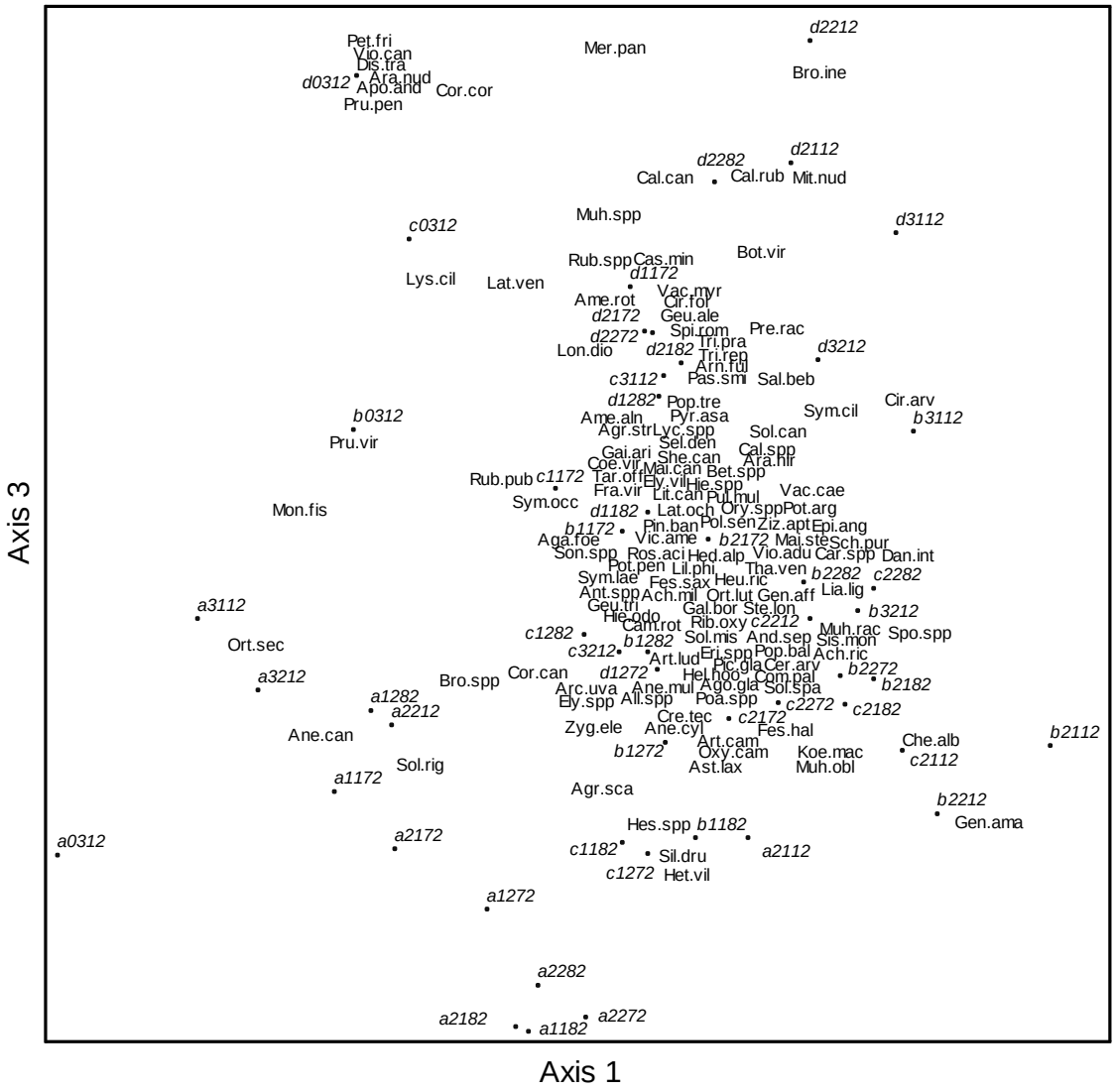

Figure 10-4. Three-dimensional ordination of plots in species space (52 plots x 131 species) using mean species cover in the forest transition plant community plots from 1975, 1983, 1995 and 2010. Plot labels represent relative centroid of each plot, and species epithets represent the relative centroid of each species. Plot numbers beginning by 'a' indicate 1975 survey, 'b' indicate 1983 survey, 'c' indicate 1995, and 'd' indicate 2010. The ordination yielded a three-dimensional solution with a final stress of 13.98. Axis 1 accounted for 27.4% and Axis 3 accounted for 33.0% of variation in the distance matrix. Axis 2 accounted for 23.5% of variation in the distance matrix, and is shown in Fig. 10-3.

11. Appendix F. Indicator species analysis

Table 11-1. Monte Carlo test of significance of observed maximum indicator value (IV) for species observed in the grassland plant community in 2010, based on 1000 randomizations. The means and standard deviations (SD) of the indicator values from the randomizations are provided, as well as p-values testing the hypothesis that there are no differences between grassland and forest transition plant communities. The p-value is based on the proportion of randomized trials with indicator value greater or equal to the observed indicator value. Species are shown in alphabetical order.

Species	IV	Mean	SD	p-value
Achillea millefolium	57.8	52.1	2.3	0.001
Achnatherum richardsonii	71.2	54.7	6.8	0.016
Agastache foeniculum	54.8	52.6	7.1	0.318
Agoseris glauca	78.0	53.5	6.2	0.002
Agrostis scabra	69.4	45.6	7.9	0.012
Allium spp.	36.1	22.2	8.2	0.054
Androsace septentrionalis	9.1	8.3	0.7	0.429
Anemone cylindrica	18.2	10.6	5.9	0.199
Anemone multifida	65.5	48.6	7.2	0.025
Antennaria spp.	58.8	43.0	9.6	0.074
Arctostaphylos uva-ursi	50.6	51.1	9.2	0.443
Arnica fulgens	50.3	23.7	7.7	0.014
Artemisia campestris	50.6	27.2	8.8	0.022
Artemisia frigida	9.1	8.3	0.7	0.448
Artemisia ludoviciana	63.6	39.9	8.6	0.015
Astragalus laxmannii	36.4	16.4	7.2	0.034
Calamagrostis canadensis	37.8	34.9	9.3	0.379
Calamagrostis rubescens	9.8	16.4	7.1	1.000
Calamagrostis spp.	51.5	53.3	3.1	0.746
Campanula rotundifolia	63.6	53.7	3.3	0.002
Cerastium arvense	12.8	13.9	5.8	0.560
Cirsium arvense	4.9	10.5	5.9	1.000
Cirsium foliosum	24.1	27.0	8.8	0.619
Coeloglossum viride	21.9	25.0	8.6	0.594
Comandra umbellata	77.3	53.9	6.2	0.001
Danthonia intermedia	73.5	45.7	9.5	0.006
Elymus lanceolatus	54.5	21.8	7.9	0.003

Elymus spp.	60.5	53.7	3.3	0.024
Erigeron spp.	62.9	46.5	7.3	0.034
Festuca hallii	63.0	54.6	3.8	0.024
Festuca saximontana	53.2	35.5	8.5	0.039
Fragaria virginiana	52.4	55.0	4.1	0.700
Gaillardia aristata	19.7	26.1	7.6	1.000
Galium boreale	54.4	51.7	2.1	0.030
Galium trifidum	18.2	10.9	5.9	0.204
Galium triflorum	9.1	8.3	0.7	0.455
Gentiana affinis	39.6	30.4	8.1	0.142
Geum aleppicum	55.7	41.8	8.4	0.069
Geum triflorum	49.4	39.2	9.8	0.153
Hedysarum alpinum	57.6	54.1	3.5	0.136
Hesperostipa spp.	73.2	44.8	9.1	0.008
Heuchera richardsonii	49.8	53.2	4.1	0.827
Hieracium spp.	48.7	52.6	5.6	0.738
Hierochloe odorata	63.6	53.9	6.4	0.082
Koeleria macrantha	87.4	49.2	7.8	0.001
Liatris ligulistylis	14.8	21.5	7.6	0.853
Lilium philadelphicum	38.5	43.0	7.9	0.625
Lithospermum canescens	43.7	51.3	6.2	0.995
Muhlenbergia racemosa	33.4	33.2	8.9	0.429
Orthocarpus luteus	44.7	30.8	8.4	0.077
Oxytropis campestris	53.0	38.8	8.2	0.070
Pascopyrum smithii	52.9	24.3	8.1	0.007
Picea glauca	22.5	16.3	7.1	0.236
Pinus banksiana	17.6	22.9	8.5	0.692
Poa spp.	30.0	19.7	7.8	0.132
Polygala senega	55.1	46.5	7.4	0.128
Potentilla arguta	67.1	54.3	6.6	0.036
Potentilla pensylvanica	30.0	19.3	7.4	0.153
Prenanthes racemosa	21.7	26.0	7.9	0.716
Pulsatilla patens	57.1	37.4	8.5	0.027
Selaginella densa	56.8	30.8	8.6	0.013
Sisyrinchium montanum	77.5	52.8	7.3	0.002
Solidago missouriensis	55.8	47.6	6.7	0.125
Solidago nemoralis	9.1	8.4	0.8	0.481
Solidago rigida	21.3	24.1	8.0	0.575
Spiranthes romanzoffiana	12.8	14.1	5.9	0.581
Thalictrum venulosum	50.1	53.2	2.8	0.983
Vicia americana	54.3	54.1	3.4	0.448

Viola adunca	50.8	52.7	2.6	0.849
Zizia aptera	70.3	52.6	7.0	0.018
Zygadenus elegans	28.2	29.5	9.3	0.459

Table 11-2. Monte Carlo test of significance of observed maximum indicator value (IV) for species observed in the forest transition plant community in 2010, based on 1000 randomizations. The means and standard deviations (SD) of the indicator values from the randomizations are provided, as well as p-values testing the hypothesis that there are no differences between grassland and forest transition plant communities. The p-value is based on the proportion of randomized trials with indicator value greater or equal to the observed indicator value. Species are shown in alphabetical order.

Species	IV	Mean	SD	p-value
Amelanchier alnifolia	44.5	52.0	6.5	0.930
Amerorchis rotundifolia	23.1	15.6	6.3	0.241
Apocynum androsaemifolium	7.7	8.3	0.7	1.000
Arabis hirsuta	7.7	8.3	0.8	1.000
Aralia nudicaulis	7.7	8.3	0.7	1.000
Betula spp.	35.7	31.2	8.5	0.233
Botrychium virginianum	15.4	10.6	5.9	0.490
Bromus inermis	15.4	11.8	4.8	0.492
Bromus spp.	63.7	45.2	8.1	0.027
Carex spp.	50.3	52.8	2.8	0.964
Castilleja miniata	7.7	8.3	0.7	1.000
Cornus canadensis	7.7	8.3	0.7	1.000
Corylus cornuta	30.8	19.0	7.7	0.127
Disporum trachycarpum	7.7	8.3	0.7	1.000
Elymus villosus	88.6	54.4	8.9	0.001
Helictotrichon hookerii	56.4	46.3	8.8	0.133
Lathyrus ochroleucus	60.9	55.0	4.0	0.075
Lathyrus venosus	15.4	12.0	4.4	0.478
Lonicera dioica	22.1	24.4	8.3	0.579
Lycopodium spp.	7.7	8.3	0.7	1.000
Lysimachia ciliata	7.7	8.3	0.7	1.000
Maianthemum canadense	43.1	31.3	9.1	0.106
Maianthemum stellatum	58.0	55.0	4.0	0.195
Mertensia paniculata	15.4	10.2	5.8	0.461
Mitella nuda	23.1	14.0	6.1	0.223
Oryzopsis spp.	33.9	36.7	9.6	0.517
Petasites frigidus	7.7	8.3	0.7	1.000
Populus tremuloides	80.0	57.0	5.6	0.001
Prunus pensylvanica	7.7	8.3	0.7	1.000
Prunus virginiana	5.5	11.3	5.3	1.000
Pyrola asarifolia	37.0	22.0	7.9	0.078
Rosa acicularis	56.3	53.7	3.3	0.183

Rubus pubescens	7.7	8.3	0.7	1.000
Rubus spp.	46.2	22.4	8.5	0.019
Salix bebbiana	57.4	49.2	9.5	0.190
Schizachne purpurascens	63.0	40.7	9.5	0.029
Shepherdia canadensis	15.4	11.5	5.1	0.492
Solidago canadensis	59.8	52.9	7.4	0.175
Solidago spathulata	22.3	22.2	8.2	0.409
Sonchus spp.	15.4	11.5	4.7	0.459
Symphoricarpos occidentalis	43.7	50.4	8.4	0.752
Symphyotrichum ciliolatum	45.0	44.1	9.8	0.417
Symphyotrichum laeve	51.7	52.9	2.8	0.664
Taraxacum officinale	51.8	54.5	5.2	0.638
Trifolium pratense	7.7	8.3	0.7	1.000
Trifolium repens	7.7	8.3	0.7	1.000
Vaccinium caespitosum	38.5	19.2	7.0	0.033
Vaccinium myrtilloides	7.7	8.3	0.7	1.000
Viola canadensis	7.7	8.3	0.7	1.000

12. Appendix G. Plot locations

Table 12-1. Quadrat locations for the prescribed burn study in Prince Albert National Park, 1975-2010. Area indicates the grassland area where plots were positioned; Wasstrom's Flats (WF), Sugar Creek (SC) and Rabbit Creek (RC). Plot No. refers to the plot number; indicated by the first four numbers followed by the quadrat number that is indicated by the last numbers ranging 1-25. Plot numbers ending in '1' indicate grassland community plots and plots numbers ending in '2' indicate forest transition community plots. UTM locations are based on NAD 83 datum.

Area	Plot No.	Zone	Easting	Northing
WF	11711	13 U	399457	5940435
WF	11712	13 U	399460	5940433
WF	11713	13 U	399462	5940429
WF	11714	13 U	399466	5940425
WF	11715	13 U	399468	5940420
WF	11716	13 U	399453	5940431
WF	11717	13 U	399456	5940429
WF	11718	13 U	399459	5940425
WF	11719	13 U	399462	5940421
WF	117110	13 U	399465	5940416
WF	117111	13 U	399448	5940430
WF	117112	13 U	399451	5940426
WF	117113	13 U	399453	5940423
WF	117114	13 U	399455	5940419
WF	117115	13 U	399459	5940416
WF	117116	13 U	399445	5940428
WF	117117	13 U	399448	5940424
WF	117118	13 U	399450	5940420
WF	117119	13 U	399452	5940417
WF	117120	13 U	399455	5940412
WF	117121	13 U	399440	5940425
WF	117122	13 U	399444	5940422
WF	117123	13 U	399447	5940417
WF	117124	13 U	399449	5940414
WF	117125	13 U	399451	5940409
WF	11721	13 U	399428	5940480
WF	11722	13 U	399438	5940474
WF	11723	13 U	399444	5940467
WF	11724	13 U	399451	5940461
WF	11725	13 U	399458	5940453
WF	11726	13 U	399420	5940470
WF	11727	13 U	399430	5940463
WF	11728	13 U	399437	5940456
WF	11729	13 U	399443	5940453
WF	117210	13 U	399453	5940448
WF	117211	13 U	399414	5940463
WF	117212	13 U	399421	5940457
WF	117213	13 U	399428	5940449
WF	117214	13 U	399433	5940446
WF	117215	13 U	399447	5940445
WF	117216	13 U	399406	5940458
WF	117217	13 U	399413	5940452
WF	117218	13 U	399416	5940449
WF	117219	13 U	399425	5940441
WF	117220	13 U	399436	5940438
WF	117221	13 U	399401	5940451
WF	117222	13 U	399406	5940443
WF	117223	13 U	399412	5940438
WF	117224	13 U	399422	5940431
WF	117225	13 U	399427	5940429
WF	11811	13 U	399308	5940259
WF	11812	13 U	399317	5940257
WF	11813	13 U	399327	5940255
WF	11814	13 U	399336	5940251
WF	11815	13 U	399344	5940248
WF	11816	13 U	399303	5940251
WF	11817	13 U	399312	5940249
WF	11818	13 U	399321	5940249
WF	11819	13 U	399330	5940245
WF	118110	13 U	399342	5940241
WF	118111	13 U	399299	5940242

WF	118112	13 U	399308	5940240
WF	118113	13 U	399318	5940238
WF	118114	13 U	399328	5940235
WF	118115	13 U	399336	5940233
WF	118116	13 U	399296	5940235
WF	118117	13 U	399306	5940232
WF	118118	13 U	399315	5940228
WF	118119	13 U	399323	5940225
WF	118120	13 U	399332	5940223
WF	118121	13 U	399291	5940226
WF	118122	13 U	399300	5940224
WF	118123	13 U	399309	5940220
WF	118124	13 U	399318	5940216
WF	118125	13 U	399327	5940213
WF	11821	13 U	399295	5940218
WF	11822	13 U	399300	5940218
WF	11823	13 U	399303	5940217
WF	11824	13 U	399309	5940216
WF	11825	13 U	399312	5940215
WF	11826	13 U	399293	5940215
WF	11827	13 U	399297	5940213
WF	11828	13 U	399301	5940212
WF	11829	13 U	399306	5940210
WF	118210	13 U	399311	5940209
WF	118211	13 U	399291	5940209
WF	118212	13 U	399296	5940206
WF	118213	13 U	399300	5940207
WF	118214	13 U	399306	5940205
WF	118215	13 U	399310	5940205
WF	118216	13 U	399290	5940205
WF	118217	13 U	399293	5940203
WF	118218	13 U	399297	5940202
WF	118219	13 U	399301	5940200
WF	118220	13 U	399306	5940200
WF	118221	13 U	399287	5940200
WF	118222	13 U	399291	5940198
WF	118223	13 U	399296	5940198
WF	118224	13 U	399302	5940198
WF	118225	13 U	399305	5940196
WF	12811	13 U	399466	5940212
WF	12812	13 U	399476	5940210
WF	12813	13 U	399486	5940208
WF	12814	13 U	399494	5940204
WF	12815	13 U	399503	5940199
WF	12816	13 U	399463	5940208
WF	12817	13 U	399472	5940206
WF	12818	13 U	399481	5940201
WF	12819	13 U	399492	5940197
WF	128110	13 U	399500	594019
WF	128111	13 U	399458	5940199
WF	128112	13 U	399467	5940194
WF	128113	13 U	399475	5940191
WF	128114	13 U	399485	5940187
WF	128115	13 U	399494	5940182
WF	128116	13 U	399456	5940191
WF	128117	13 U	399464	5940188
WF	128118	13 U	399473	5940185
WF	128119	13 U	399482	5940178
WF	128120	13 U	399490	5940173
WF	128121	13 U	399451	5940180
WF	128122	13 U	399460	5940176
WF	128123	13 U	399468	5940173
WF	128124	13 U	399477	5940169
WF	128125	13 U	399486	5940165
WF	12821	13 U	399448	5940177
WF	12822	13 U	399456	5940172
WF	12823	13 U	399463	5940169
WF	12824	13 U	399474	5940164
WF	12825	13 U	399483	5940158
WF	12826	13 U	399444	5940165
WF	12827	13 U	399454	5940161
WF	12828	13 U	399463	5940157
WF	12829	13 U	399471	5940156
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WF	128211	13 U	399441	5940159
WF	128212	13 U	399449	5940152
WF	128213	13 U	399458	5940146
WF	128214	13 U	399467	5940146
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WF	128218	13 U	399456	5940141
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WF	128222	13 U	399442	5940135

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WF	12714	13 U	399619	5940344
WF	12715	13 U	399629	5940339
WF	12716	13 U	399589	5940350
WF	12717	13 U	399597	5940344
WF	12718	13 U	399607	5940339
WF	12719	13 U	399614	5940335
WF	127110	13 U	399625	5940331
WF	127111	13 U	399583	5940341
WF	127112	13 U	399592	5940335
WF	127113	13 U	399600	5940330
WF	127114	13 U	399609	5940327
WF	127115	13 U	399619	5940322
WF	127116	13 U	399578	5940332
WF	127117	13 U	399587	5940326
WF	127118	13 U	399596	5940321
WF	127119	13 U	399605	5940317
WF	127120	13 U	399614	5940312
WF	127121	13 U	399573	5940323
WF	127122	13 U	399583	5940317
WF	127123	13 U	399591	5940311
WF	127124	13 U	399600	5940308
WF	127125	13 U	399608	5940305
WF	12721	13 U	399572	5940315
WF	12722	13 U	399580	5940309
WF	12723	13 U	399589	5940303
WF	12724	13 U	399597	5940299
WF	12725	13 U	399606	5940296
WF	12726	13 U	399571	5940304
WF	12727	13 U	399577	5940299
WF	12728	13 U	399585	5940292
WF	12729	13 U	399594	5940288
WF	127210	13 U	399604	5940288
WF	127211	13 U	399566	5940294
WF	127212	13 U	399574	5940290
WF	127213	13 U	399582	5940283
WF	127214	13 U	399590	5940280
WF	127215	13 U	399600	5940277
WF	127216	13 U	399563	5940286
WF	127217	13 U	399572	5940282
WF	127218	13 U	399579	5940275
WF	127219	13 U	399588	5940270
WF	127220	13 U	399598	5940268
WF	127221	13 U	399559	5940276
WF	127222	13 U	399567	5940272
WF	127223	13 U	399575	5940265
WF	127224	13 U	399583	5940261
WF	127225	13 U	399591	5940257
WF	21711	13 U	399708	5940368
WF	21712	13 U	399714	5940361
WF	21713	13 U	399725	5940353
WF	21714	13 U	399729	5940347
WF	21715	13 U	399735	5940340
WF	21716	13 U	399702	5940359
WF	21717	13 U	399709	5940353
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WF	21719	13 U	399723	5940339
WF	217110	13 U	399730	5940334
WF	217111	13 U	399694	5940353
WF	217112	13 U	399701	5940346
WF	217113	13 U	399709	5940339
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WF	217116	13 U	399688	5940346
WF	217117	13 U	399694	5940338
WF	217118	13 U	399703	5940333
WF	217119	13 U	399710	5940326
WF	217120	13 U	399716	5940318
WF	217121	13 U	399682	5940338
WF	217122	13 U	399688	5940331
WF	217123	13 U	399696	5940323
WF	217124	13 U	399703	5940317
WF	217125	13 U	399711	5940310
WF	21721	13 U	399727	5940310
WF	21722	13 U	399730	5940302
WF	21723	13 U	399732	5940292
WF	21724	13 U	399734	5940282
WF	21725	13 U	399737	5940275
WF	21726	13 U	399719	5940302
WF	21727	13 U	399723	5940293
WF	21728	13 U	399725	5940285

WF	21729	13 U	399728	5940275
WF	217210	13 U	399730	5940268
WF	217211	13 U	399713	5940296
WF	217212	13 U	399716	5940287
WF	217213	13 U	399720	5940278
WF	217214	13 U	399724	5940269
WF	217215	13 U	399724	5940260
WF	217216	13 U	399704	5940289
WF	217217	13 U	399709	5940280
WF	217218	13 U	399711	5940272
WF	217219	13 U	399715	5940262
WF	217220	13 U	399719	5940254
WF	217221	13 U	399696	5940283
WF	217222	13 U	399700	5940275
WF	217223	13 U	399704	5940265
WF	217224	13 U	399707	5940256
WF	217225	13 U	399709	5940247
WF	21811	13 U	399666	5940109
WF	21812	13 U	399675	5940101
WF	21813	13 U	399685	5940095
WF	21814	13 U	399691	5940091
WF	21815	13 U	399701	5940084
WF	21816	13 U	399665	5940102
WF	21817	13 U	399673	5940097
WF	21818	13 U	399681	5940094
WF	21819	13 U	399690	5940086
WF	218110	13 U	399698	5940081
WF	218111	13 U	399662	5940098
WF	218112	13 U	399670	5940092
WF	218113	13 U	399678	5940088
WF	218114	13 U	399685	5940084
WF	218115	13 U	399695	5940079
WF	218116	13 U	399660	5940096
WF	218117	13 U	399670	5940091
WF	218118	13 U	399677	5940086
WF	218119	13 U	399685	5940082
WF	218120	13 U	399693	5940076
WF	218121	13 U	399658	5940093
WF	218122	13 U	399664	5940088
WF	218123	13 U	399672	5940081
WF	218124	13 U	399680	5940075
WF	218125	13 U	399689	5940070
WF	21821	13 U	399687	5940154
WF	21822	13 U	399695	5940151
WF	21823	13 U	399704	5940147
WF	21824	13 U	399714	5940142
WF	21825	13 U	399721	5940138
WF	21826	13 U	399680	5940145
WF	21827	13 U	399690	5940140
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13. Appendix H. Precipitation and species abundance-occupancy relationship change over time

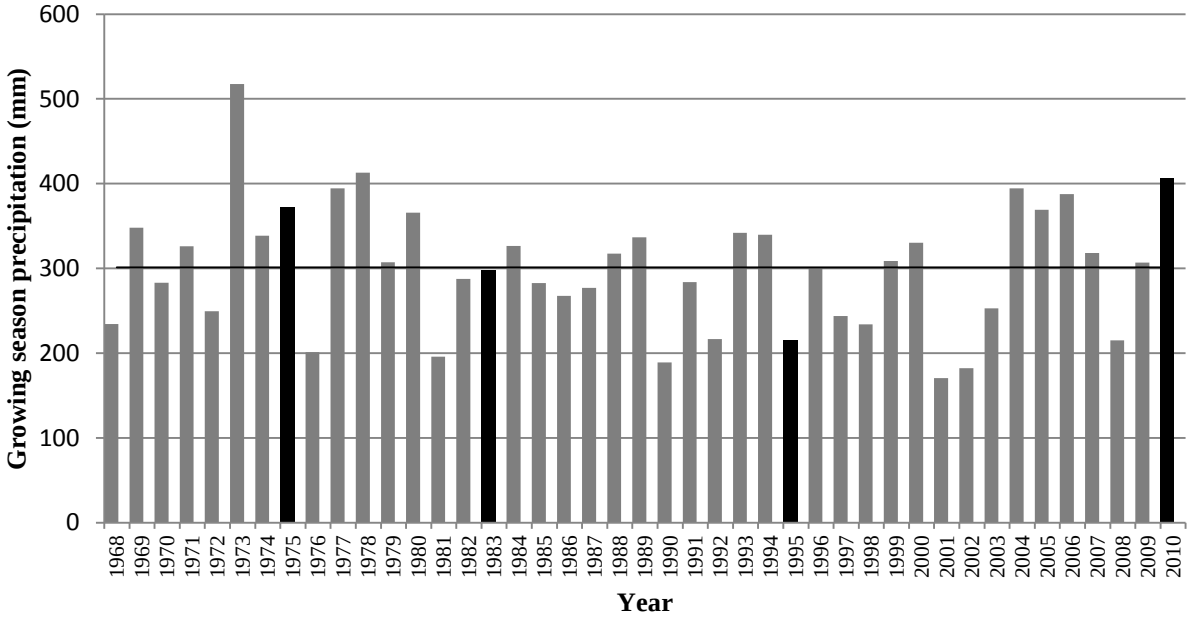

Figure 13-1. Growing season precipitation May-September 1968-2010 from the Big River, Saskatchewan weather station. Survey years for the prescribed burn study in Prince Albert National Park, 1975-2010, are denoted by black bars. The trendline represents 42-year average of growing season precipitation (302 mm) (Environment Canada, 2011).

Table 13-2. Species change in abundance between survey periods during the prescribed burn study in Prince Albert National Park, 1975-2010. Changes in abundance of species between survey periods is shown by ΔA, and changes in species occupancy between survey periods is shown by ΔO.

	1975-1983		1983-1995		1995-2010	
Species	ΔA	ΔO	ΔA	ΔO	ΔA	ΔO
Achillea millefolium	1.83	3	-2.29	-5	5.17	5
Achnatherum richardsonii	8.38	0	-0.75	0	0.00	0
Agastache foeniculum	0.00	3	-1.00	-2	0.00	0
Agoseris glauca	0.00	0	0.00	0	1.33	3
Agrostis scabra	0.00	0	0.00	0	1.00	2
Allium spp.	9.13	8	-6.63	-2	10.25	2
Amelanchier alnifolia	18.00	4	-12.75	0	10.88	0
Amerorchis rotundifolia	4.00	6	0.60	-1	3.28	3
Anemone canadensis	0.00	0	0.00	0	4.80	5
Anemone cylindrica	4.25	0	1.13	0	-0.75	0
Anemone multifida	5.82	1	-4.00	0	-2.85	-3
Antennaria spp.	6.00	1	-6.00	-1	0.00	0
Arabis hirsuta	5.25	0	-0.75	0	-2.50	0
Arctostaphylos uva-ursi	2.17	6	1.33	0	3.50	0
Arnica fulgens	-1.25	-4	3.00	1	-2.00	3
Artemisia campestris	4.43	0	-2.29	1	2.38	0
Artemisia frigida	1.75	0	-4.00	-4	14.00	7
Artemisia ludoviciana	14.13	0	-16.46	-2	1.58	2
Astragalus laxmannii	1.50	4	-0.50	-3	-1.00	-1
Betula spp.	2.33	3	-2.33	-3	1.60	5
Bromus spp.	0.00	0	4.25	8	-2.75	-6
Calamagrostis canadensis	0.00	0	0.00	0	4.80	5
Calamagrostis rubescens	-2.71	-2	-0.17	0	-0.50	-4
Calamagrostis spp.	0.00	0	2.00	1	-2.00	-1
Campanula rotundifolia	1.75	4	0.75	-2	-0.83	1
Carex spp.	2.75	0	-0.38	0	5.13	0
Cerastium arvense	1.00	0	3.50	-1	1.29	2
Chenopodium album	7.63	0	-1.50	0	4.63	0
Cirsium arvense	1.00	1	0.00	1	1.50	2
Cirsium foliosum	3.00	7	-2.00	-4	0.00	-2
Coeloglossum viride	0.00	0	1.00	3	-1.00	-3
Comandra umbellata	1.69	2	0.21	-1	-2.50	-5
Crepis tectorum	8.08	5	-4.46	-1	0.21	1

Danthonia intermedia	1.57	4	-0.74	-1	1.17	1
Elymus lanceolatus	1.00	0	-2.00	-2	0.00	0
Elymus spp.	0.00	0	0.00	0	1.67	6
Elymus villosus	-0.33	1	0.00	0	1.93	2
Epilobium angustifolium	-0.50	0	0.00	-1	0.00	0
Erigeron spp.	0.43	0	-0.61	1	1.18	-1
Festuca brachyphylla	1.25	3	-2.25	-4	2.25	4
Festuca hallii	4.50	0	-6.38	0	6.13	0
Festuca saximontana	9.25	8	-8.25	-6	0.00	0
Fragaria virginiana	0.00	0	1.00	1	-1.00	-1
Gaillardia aristata	1.00	0	-2.00	-1	0.00	0
Galium boreale	0.00	0	0.00	0	4.00	2
Galium trifidum	0.00	0	1.00	1	1.25	3
Gentiana affinis	7.46	1	2.00	0	1.38	0
Gentianella amarella	0.00	0	7.14	7	-7.14	-7
Geum aleppicum	2.50	2	-0.50	-1	-0.50	1
Geum triflorum	5.88	0	-9.00	0	10.88	0
Hedysarum alpinum	1.33	0	0.21	1	8.16	1
Helictotrichon hookerii	2.33	3	-1.33	-2	0.00	3
Hesperostipa spp.	6.00	0	-1.25	0	1.75	0
Heuchera richardsonii	0.00	0	0.00	0	1.00	2
Hieracium spp.	2.00	4	-1.00	-3	0.33	2
Hierochloe odorata	3.00	2	-3.00	-2	0.00	0
Koeleria macrantha	0.00	0	0.00	0	2.00	6
Lathyrus ochroleucus	0.17	-2	0.00	0	0.20	1
Liatris ligulistylis	6.50	0	-1.75	0	5.38	0
Lilium philadelphicum	4.71	7	-2.21	-1	2.13	2
Lithospermum canescens	7.63	8	-5.63	-7	7.14	6
Lycopodium spp.	0.88	0	1.25	0	-1.50	0
Maianthemum canadense	0.00	0	0.00	0	1.67	3
Maianthemum stellatum	2.00	0	-2.00	-2	1.75	2
Monarda fistulosa	1.67	1	-0.54	5	5.00	0
Muhlenbergia racemosa	0.00	0	1.00	2	-1.00	-2
Muhlenbergia spp.	0.00	0	1.00	1	-1.00	-1
Mulgedium oblongifolium	0.55	-1	0.57	1	3.63	0
Orthilia secunda	-1.00	-1	0.00	0	0.00	0
Orthocarpus luteus	-2.00	-2	-1.00	-1	0.00	0
Oryzopsis spp.	9.00	6	-7.20	-1	0.20	1
Oxytropis campestris	-1.50	-2	0.00	0	0.00	0
Pascopyrum smithii	3.52	1	-0.25	0	-2.13	-1
Picea glauca	8.89	3	-3.64	1	9.38	0

Pinus banksiana	2.40	1	-0.07	1	8.67	1
Poa spp.	1.00	1	-2.00	-2	1.00	3
Poaceae unknown	0.00	0	0.00	0	1.00	2
Polygala senega	1.67	6	-1.67	-6	3.86	7
Populus balsamifera	0.00	0	0.00	0	1.00	1
Populus tremuloides	0.00	0	1.00	1	5.50	5
Potentilla arguta	0.00	0	1.00	1	-1.00	-1
Potentilla pensylvanica	5.42	-2	-6.79	2	14.75	0
Prenanthes racemosa	3.00	3	-0.20	2	-0.13	1
Prunus virginiana	14.13	0	-23.38	-8	21.25	8
Pulsatilla patens	0.00	0	0.00	0	1.00	1
Pyrola asarifolia	5.50	-1	-7.00	-1	1.50	4
Rosa acicularis	0.00	0	21.00	8	-13.00	-7
Salix bebbiana	-4.71	-7	0.00	0	0.00	0
Schizachne purpurascens	0.00	0	0.00	0	1.00	2
Selaginella densa	2.96	5	-2.83	-3	-1.80	-5
Silene drummondii	0.00	0	1.00	1	0.67	2
Sisyrinchium montanum	3.25	0	3.00	0	3.88	0
Solidago canadensis	-1.00	-4	1.50	2	3.00	6
Solidago missouriensis	2.38	0	2.00	0	2.38	0
Solidago nemoralis	-4.38	0	1.50	0	5.88	0
Solidago rigida	14.88	0	-5.75	0	5.88	0
Solidago spathulata	0.00	1	0.00	1	3.38	5
Sonchus spp.	-2.33	0	1.00	0	2.00	1
Spiranthes romanzoffiana	5.43	7	1.29	0	1.57	0
Stellaria longifolia	-0.30	-1	1.68	3	2.00	0
Symphoricarpos occidentalis	0.00	0	1.00	1	4.00	0
Symphyotrichum ciliolatum	0.00	0	0.00	0	1.33	3
Symphyotrichum laeve	2.00	1	-0.50	1	1.50	0
Taraxacum officinale	0.00	0	1.67	3	-1.67	-3
Thalictrum venulosum	-0.74	-1	-2.33	-2	4.13	4
Vaccinium caespitosum	0.00	0	0.00	0	1.00	1
Vicia americana	2.63	0	0.88	0	4.38	0
Viola adunca	0.00	0	1.00	3	0.33	0
Zizia aptera	3.37	-1	-6.03	1	2.83	0
Zygadenus elegans	0.00	0	-6.00	-1	0.00	0

14. Appendix I. 2010 woody species cover and stem diameter

Table 14-1. Percent cover for trembling aspen (pop.tre), saskatoon (ame.aln), bog birch (bet.gla), Bebb's willow (sal.beb) and rose (ros.aci) in all forest transition community quadrats in 2010. Plot indicates the plot surveyed, Quad indicates the quadrat number within the plot surveyed.

Plot	Quad	Pop.tre	Ame.aln	Bet.gla	Sal.beb	Ros.aci
2212	1	40				12
2212	2	50				18
2212	3	30			50	11
2212	4	40				23
2212	5	22				16
2212	6	45				11
2212	7	38				18
2212	8	55				16
2212	9	40				20
2212	10	35				22
2212	11	68			16	26
2212	12	30			12	10
2212	13	25			10	15
2212	14	15			20	11
2212	15	5		4		18
2212	16	15				11
2212	17	45			24	16
2212	18	50				15
2212	19	80		35	68	8
2212	20	32		4	25	13
2212	21	50			52	10
2212	22	70				1
2212	23	80		10		12
2212	24	68				10
2212	25	48		70		11
2112	1	25			23	8
2112	2	75				20
2112	3	38			30	25
2112	4	10				23
2112	5	8			28	12
2112	6	30			45	28
2112	7	11			9	40
2112	8	70			55	25
2112	9	65				25
2112	10	1				18
2112	11	10				38
2112	12	60	1		12	15
2112	13	80				20
2112	14	50				7
2112	15	40				11
2112	16	50			5	6
2112	17	60				19
2112	18	70				12
2112	19	12				6
2112	20	70				9
2112	21	75				15
2112	22	75				7
2112	23	70				5
2112	24	12				5
2112	25	26				13
1172	1	25				
1172	2	30				5
1172	3	10				1
1172	4	10				
1172	5	3	1			1
1172	6	30	1			1
1172	7	65	2			1
1172	8	30	5		3	
1172	9	33	20			3
1172	10	60	10			13
1172	11	75	1			6
1172	12	80				10
1172	13	40	20		40	14
1172	14	30				16
1172	15	35				18
1172	16	70				18
1172	17	30	18		28	25
1172	18	65			40	11
1172	19	25	16		17	16
1172	20	25	8			4
1172	21	35	18			20
1172	22	55			35	30
1172	23	65	20		15	20
1172	24	50	3			3
1172	25	50	3			3
3112	1	40	3	2	20	25
3112	2	15		23	16	25
3112	3	25		1	15	22
3112	4	25		3	50	20
3112	5	6		20	60	25
3112	6	30	7		20	22
3112	7	16	2		28	15
3112	8	23	1	14	31	22
3112	9	10	4	26	22	6
3112	10	8				11
3112	11	40			5	25
3112	12	25		60	12	6
3112	13	30		20	15	8
3112	14	8		6	50	6
3112	15	12		22	18	11
3112	16	30		10		24
3112	17	55			20	10
3112	18	25	1	45		8
3112	19	18		3	58	12
3112	20	10		13	20	12
3112	21	20	1	14	30	10
3112	22	22	2	24		25
3112	23	26		6	40	15
3112	24	23	4		50	15

3112	25	15		20	60	16
3212	1	15	15		1	11
3212	2	18	14	20		12
3212	3	18	10	60	1	8
3212	4	10	4	45	2	8
3212	5	12	8	45	25	9
3212	6	13	9	12	8	13
3212	7	20	10	8		10
3212	8	20		50	1	5
3212	9	14	1	50	10	9
3212	10	20	8	30	40	7
3212	11	25	3			8
3212	12	19	6	20		4
3212	13	20	6	5	14	8
3212	14	22	5	12	60	5
3212	15	15	4	45	30	10
3212	16	20			8	4
3212	17	25				13
3212	18	12		32		9
3212	19	30	8			10
3212	20	30	7	60		6
3212	21	25			1	10
3212	22	24	7			11
3212	23	23	6	25		4
3212	24	15	12	12		18
3212	25	18	3	35	35	12
2282	1	50	4		2	1
2282	2	69	1			2
2282	3	29	4	30	10	
2282	4	47	4	2	4	5
2282	5	70		3	4	2
2282	6	38			9	10
2282	7	18	3	20	7	1
2282	8	22		40	15	5
2282	9	75		2		2
2282	10	50	8	8	3	
2282	11	65		6		3
2282	12	25			9	
2282	13	15		4	25	
2282	14	50		60	1	1
2282	15	40				4
2282	16	75	1			
2282	17	60				1
2282	18	25	30		25	1
2282	19	40	75		15	1
2282	20	5				10
2282	21	3				11
2282	22	65				10
2282	23	28		30	5	2
2282	24	25				8
2282	25					
2172	1	22	25			25
2172	2	20				28
2172	3	25				20
2172	4	35			4	30
2172	5	30			4	15
2172	6	50				25
2172	7	3	1		28	12
2172	8	10	3			7
2172	9	30	3			40
2172	10	35	1			25
2172	11	25	19			2
2172	12	10				10
2172	13	20	15			11
2172	14	40	6			8
2172	15	25	20			1
2172	16	1	1			1
2172	17	3				4

2172	18	22				38
2172	19	25				27
2172	20	50	2			2
2172	21		6			2
2172	22	2	5			3
2172	23	8				2
2172	24					8
2172	25	12				2
1272	1	25				5
1272	2					25
1272	3	2	2			
1272	4	5	4			15
1272	5	1	1			9
1272	6	8	10			6
1272	7	12	6			4
1272	8	5	18			3
1272	9					10
1272	10					7
1272	11	1				3
1272	12					7
1272	13					1
1272	14	1	1			3
1272	15		3			3
1272	16					18
1272	17					3
1272	18	1				3
1272	19	1			10	1
1272	20					2
1272	21					8
1272	22					10
1272	23					5
1272	24					4
1272	25		3			
2272	1	60	3			2
2272	2	75				2
2272	3	50				3
2272	4	40				8
2272	5	5				3
2272	6	70	8			7
2272	7	50				
2272	8	50			20	2
2272	9	50	15	20		5
2272	10	25				15
2272	11	25	5	20	1	5
2272	12	65	1	3		1
2272	13	15				
2272	14	30	10	3		8
2272	15	30	5			35
2272	16	30	3	40	2	1
2272	17	21	1	20		10
2272	18	70		45		3
2272	19	50				25
2272	20	20				30
2272	21	1				25
2272	22	8				8
2272	23	5				21
2272	24	2				20
2272	25	3				35
2182	1	1				2
2182	2					
2182	3					1
2182	4	10				9
2182	5	40				2
2182	6					1
2182	7	30				3
2182	8	75				
2182	9	50				
2182	10	65				

2182	11	50				
2182	12	65				
2182	13	60				2
2182	14	25				12
2182	15	50				10
2182	16	15				27
2182	17	60				14
2182	18	25				20
2182	19	30	10			25
2182	20	28		28		1
2182	21	30				30
2182	22	30	35			22
2182	23	50	40			15
2182	24	70			15	4
2182	25	60		55	15	2
0312	1	1	5			4
0312	2	2	2			8
0312	3	50	8			3
0312	4	10	25			20
0312	5	20	85			7
0312	6	20	30			10
0312	7	15	30			2
0312	8	5	25			21
0312	9	15	6			20
0312	10	26	25			15
0312	11	20	65			3
0312	12	2	50			1
0312	13	4	60			4
0312	14	30	20			7
0312	15	25	75			12
0312	16	15	2			3
0312	17		15	47		6
0312	18	35	18			7
0312	19	2	12			4
0312	20	22	29			28
0312	21		10			4
0312	22		3		1	4
0312	23	50		12		3
0312	24	30	5			23
0312	25	10	15			12
1282	1	60				22
1282	2	30				18
1282	3	18	2			10
1282	4	1	3			1
1282	5		25			2
1282	6	25	8		10	38
1282	7	50	2			18
1282	8	30	1			20
1282	9	45				23
1282	10	25			26	8
1282	11	66	1			7
1282	12	50	6			20
1282	13	42				12
1282	14	50	2			12
1282	15	60	24			10
1282	16	12				12
1282	17	50				60
1282	18	20	1			23
1282	19	45				30
1282	20	1				18
1282	21					4
1282	22	8	7			7
1282	23	8	5			1
1282	24	13	6			6
1282	25	3	8			5
1182	1	28				11
1182	2	29	2			4
1182	3	40				8
1182	4	60				16
1182	5	24				6
1182	6	30				20
1182	7	50				5
1182	8	23				14
1182	9	10				3
1182	10	8				1
1182	11	40				15
1182	12	15	3			3
1182	13				15	8
1182	14	12				3
1182	15	1				1
1182	16	40			6	8
1182	17	40				25
1182	18	35	8		1	23
1182	19	15	15			3
1182	20	30	15			5
1182	21	20	6			6
1182	22	15	11			15
1182	23	20	30			6
1182	24	15	9			18
1182	25	25	20			8

Table 14-2. Stem diameters and clump numbers for woody species in all forest transition community quadrats in 2010. Plot indicates the plot surveyed, Quad indicates the quadrat number within the plot surveyed. S.D. indicates the diameter at stem base (cm), and Clu. indicates the number of bog birch or willow clumps in each quadrat. Note species indicated by seven letter epithet rather than six letter epithet.

Plot	Quad	Species	S.D.	Clu.
1172	1	Poputre	0.5	
1172	1	Poputre	0.5	
1172	1	Poputre	1	
1172	1	Poputre	1	
1172	1	Poputre	0.75	
1172	1	Poputre	1.25	
1172	1	Poputre	2	
1172	1	Poputre	1	
1172	1	Poputre	5	
1172	2	Poputre	0.5	
1172	2	Poputre	1	
1172	2	Poputre	0.5	
1172	2	Poputre	0.5	
1172	2	Poputre	1.5	
1172	2	Poputre	0.75	
1172	2	Poputre	4.5	
1172	2	Poputre	0.75	
1172	2	Poputre	1	
1172	2	Poputre	2.5	
1172	2	Poputre	1	
1172	2	Poputre	1	
1172	2	Rosaaci	0.25	
1172	2	Rosaaci	0.25	
1172	2	Rosaaci	0.5	
1172	2	Rosaaci	0.25	
1172	2	Rosaaci	0.25	
1172	3	Poputre	0.75	
1172	3	Poputre	0.5	
1172	3	Poputre	1.5	
1172	3	Poputre	0.5	
1172	3	Poputre	0.25	
1172	3	Poputre	0.25	
1172	3	Poputre	0.25	
1172	3	Poputre	0.75	
1172	3	Poputre	0.5	
1172	3	Rosaaci	0.25	
1172	3	Rosaaci	0.25	
1172	4	Poputre	0.75	
1172	4	Poputre	1.25	
1172	4	Poputre	0.25	
1172	4	Poputre	1	
1172	4	Poputre	0.75	
1172	4	Pinuban	3	
1172	5	Poputre	0.5	
1172	5	Poputre	0.5	
1172	5	Poputre	0.25	
1172	5	Amelaln	0.5	
1172	5	Amelaln	0.5	
1172	5	Rosaaci	0.25	
1172	6	Rosaaci	0.25	
1172	6	Poputre	1.25	
1172	6	Poputre	3.5	
1172	6	Poputre	1.5	
1172	6	Poputre	2	
1172	6	Poputre	5	
1172	6	Poputre	4	
1172	6	Poputre	8.5	
1172	6	Amelaln	0.75	
1172	7	Poputre	4.5	
1172	7	Poputre	2	
1172	7	Poputre	2	
1172	7	Poputre	2	
1172	7	Poputre	1	
1172	7	Poputre	1	
1172	7	Poputre	1	
1172	7	Poputre	1.5	
1172	7	Poputre	0.5	
1172	7	Amelaln	0.25	
1172	7	Amelaln	0.25	
1172	7	Amelaln	0.5	
1172	7	Rosaaci	0.25	
1172	7	Rosaaci	0.25	
1172	7	Rosaaci	0.25	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	0.5	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1	
1172	8	Poputre	1.5	
1172	8	Poputre	1.5	
1172	8	Amelaln	0.5	
1172	9	Poputre	8	
1172	9	Poputre	1	
1172	9	Poputre	0.5	
1172	9	Poputre	0.5	
1172	9	Poputre	0.5	
1172	9	Amelaln	0.5	
1172	9	Amelaln	0.5	
1172	9	Amelaln	0.5	
1172	9	Amelaln	0.5	
1172	9	Amelaln	0.5	
1172	9	Amelaln	0.25	
1172	9	Amelaln	1	
1172	9	Amelaln	1	
1172	9	Rosaaci	0.25	
1172	9	Rosaaci	0.25	
1172	9	Rosaaci	0.25	
1172	10	Poputre	3.5	
1172	10	Poputre	3.5	
1172	10	Poputre	5	
1172	10	Poputre	5	
1172	10	Poputre	10.5	
1172	10	Amelaln	0.25	
1172	10	Amelaln	0.25	
1172	10	Amelaln	0.25	
1172	10	Amelaln	0.25	
1172	10	Amelaln	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.25	
1172	10	Rosaaci	0.5	
1172	11	Poputre	1.5	
1172	11	Poputre	2.5	
1172	11	Poputre	2.5	
1172	11	Poputre	2.5	
1172	11	Poputre	3	
1172	11	Poputre	1	
1172	11	Poputre	1	
1172	11	Amelaln	0.5	
1172	11	Rosaaci	0.25	
1172	11	Rosaaci	0.25	
1172	12	Poputre	2	
1172	12	Poputre	2	
1172	12	Poputre	2	
1172	12	Poputre	2	
1172	12	Poputre	3	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	12	Rosaaci	0.25	
1172	13	Poputre	6	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.25	
1172	13	Amelaln	0.5	
1172	13	Amelaln	0.5	
1172	13	Amelaln	1	
1172	13	Salibeb		3
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	
1172	13	Rosaaci	0.25	

1172	13	Rosaaci	0.5	
1172	13	Rosaaci	0.5	
1172	14	Poputre	3	
1172	14	Poputre	0.5	
1172	14	Poputre	1	
1172	14	Poputre	6	
1172	14	Poputre	3.5	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	14	Rosaaci	0.25	
1172	15	Poputre	5	
1172	15	Poputre	5.5	
1172	15	Poputre	1	
1172	15	Poputre	1	
1172	15	Poputre	0.5	
1172	15	Poputre	0.5	
1172	15	Poputre	0.5	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
1172	15	Rosaaci	0.25	
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2172	1	Poputre	1.5	
2172	1	Poputre	8	
2172	1	Poputre	2	
2172	1	Poputre	4	
2172	1	Pinuban	9	
2172	1	Poputre	0.75	
2172	1	Poputre	0.5	
2172	1	Amelaln	0.25	
2172	1	Amelaln	0.25	
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2172	1	Rosaaci	0.5	
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2172	1	Rosaaci	0.5	
2172	2	Poputre	0.5	
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2172	2	Poputre	2	
2172	2	Poputre	0.25	
2172	2	Rosaaci	0.25	
2172	2	Rosaaci	0.25	
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2172	2	Rosaaci	0.5	

2172	3	Poputre	0.25	
2172	3	Poputre	2	
2172	3	Poputre	6	
2172	3	Poputre	1.5	
2172	3	Poputre	1	
2172	3	Poputre	4	
2172	3	Poputre	0.25	
2172	3	Salibeb		1
2172	3	Rosaaci	0.25	
2172	3	Rosaaci	0.25	
2172	3	Rosaaci	0.25	
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2172	3	Rosaaci	0.25	
2172	3	Pinuban	0.25	
2172	4	Poputre	3.5	
2172	4	Poputre	1.5	
2172	4	Poputre	1	
2172	4	Poputre	1	
2172	4	Poputre	1	
2172	4	Rosaaci	0.25	
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2172	4	Rosaaci	0.5	
2172	5	Amelaln	0.25	
2172	5	Salibeb		2
2172	5	Rosaaci	0.25	
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2172	5	Rosaaci	0.25	
2172	6	Poputre	3	
2172	6	Poputre	3.5	
2172	6	Poputre	4	
2172	6	Poputre	1	
2172	6	Poputre	4	
2172	6	Rosaaci	0.5	
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2172	6	Rosaaci	0.5	
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2172	7	Poputre	0.5	
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2172	7	Poputre	1	
2172	7	Poputre	0.25	
2172	7	Poputre	0.5	
2172	7	Poputre	0.75	
2172	7	Salibeb		1
2172	7	Pinuban	1.5	
2172	7	Amelaln	0.5	
2172	7	Rosaaci	0.25	
2172	7	Rosaaci	0.25	
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2172	8	Poputre	1.5	
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2172	8	Poputre	0.5	
2172	8	Poputre	0.5	
2172	8	Poputre	1	
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2172	8	Rosaaci	0.25	
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2172	9	Poputre	4	
2172	9	Poputre	2	
2172	9	Poputre	6.5	
2172	9	Amelaln	0.5	
2172	9	Amelaln	0.5	
2172	9	Amelaln	1	
2172	9	Amelaln	1	
2172	9	Amelaln	1.5	
2172	9	Rosaaci	0.25	
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2172	10	Poputre	9	
2172	10	Poputre	5	
2172	10	Poputre	5	
2172	10	Poputre	5	
2172	10	Poputre	5	
2172	10	Rosaaci	0.25	
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2172	11	Poputre	1	
2172	11	Poputre	3.5	
2172	11	Amelaln	1	
2172	11	Amelaln	0.5	
2172	11	Amelaln	0.25	
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2172	11	Amelaln	0.75	
2172	11	Amelaln	1	
2172	11	Amelaln	0.25	
2172	11	Rosaaci	0.5	
2172	11	Rosaaci	0.5	
2172	11	Rosaaci	0.25	
2172	11	Rosaaci	0.25	
2172	12	Poputre	0.75	
2172	12	Poputre	0.75	
2172	12	Poputre	1	
2172	12	Rosaaci	0.25	
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2172	12	Rosaaci	0.5	
2172	12	Rosaaci	0.5	

2172	13	Poputre	1.5	
2172	13	Poputre	1.5	
2172	13	Poputre	0.5	
2172	13	Amelaln	0.5	
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2172	13	Rosaaci	0.5	
2172	14	Poputre	4.5	
2172	14	Poputre	6	
2172	14	Poputre	3	
2172	14	Poputre	3.5	
2172	14	Poputre	4.5	
2172	14	Poputre	6.5	
2172	14	Poputre	8.5	
2172	14	Poputre	8	
2172	14	Poputre	8	
2172	14	Poputre	6	
2172	14	Amelaln	0.25	
2172	14	Amelaln	0.25	
2172	14	Amelaln	1	
2172	14	Amelaln	0.5	
2172	14	Amelaln	1	
2172	14	Amelaln	0.5	
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2172	14	Amelaln	0.25	
2172	14	Rosaaci	0.25	
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2172	14	Rosaaci	1	
2172	14	Rosaaci	1	
2172	14	Rosaaci	1	
2172	15	Poputre	1	
2172	15	Poputre	5.5	
2172	15	Amelaln	0.75	
2172	15	Amelaln	0.75	

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2172	15	Amelaln	0.25	
2172	15	Amelaln	1	
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2172	15	Rosaaci	0.25	
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2172	16	Poputre	0.75	
2172	16	Poputre	0.75	
2172	16	Amelaln	0.5	
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2172	16	Amelaln	0.5	
2172	16	Amelaln	0.5	
2172	16	Rosaaci	0.25	
2172	17	Poputre	0.75	
2172	17	Poputre	0.75	
2172	17	Poputre	0.5	
2172	17	Rosaaci	0.5	
2172	17	Rosaaci	0.25	
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2172	18	Poputre	2	
2172	18	Poputre	3	
2172	18	Rosaaci	0.25	
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2172	19	Poputre	3	
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2172	19	Rosaaci	0.25	
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2172	20	Poputre	4	
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2172	20	Poputre	5	
2172	20	Poputre	8	
2172	20	Poputre	8	
2172	20	Poputre	4.5	
2172	20	Poputre	4.5	
2172	20	Poputre	5.5	
2172	20	Amelaln	0.25	
2172	20	Amelaln	0.25	
2172	20	Amelaln	0.75	
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2172	21	Amelaln	0.25	
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2172	22	Poputre	0.5	
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2172	22	Rosaaci	0.25	
2172	23	Poputre	0.5	
2172	23	Poputre	1.5	
2172	23	Pinuban	0.5	
2172	23	Rosaaci	0.25	
2172	23	Rosaaci	0.25	
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2172	24	Rosaaci	0.25	
2172	25	Poputre	0.5	
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2112	20	Poputre	7	
2112	20	Poputre	7.5	
2112	20	Poputre	8.5	
2112	20	Rosaaci	0.25	
2112	20	Rosaaci	0.25	
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2112	20	Rosaaci	0.25	
2112	20	Rosaaci	0.25	
2112	21	Poputre	4.5	
2112	21	Poputre	5	
2112	21	Poputre	8	
2112	21	Poputre	3.5	
2112	21	Poputre	4.5	
2112	21	Poputre	7	

2112	21	Poputre	4.5	
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2112	21	Rosaaci	0.5	
2112	22	Poputre	5	
2112	22	Poputre	5	
2112	22	Poputre	6	
2112	22	Poputre	7.5	
2112	22	Rosaaci	0.25	
2112	22	Rosaaci	0.25	
2112	22	Rosaaci	0.25	
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2112	22	Rosaaci	0.25	
2112	23	Poputre	5.5	
2112	23	Poputre	7.5	
2112	23	Poputre	8	
2112	23	Poputre	4	
2112	23	Poputre	4.5	
2112	23	Poputre	7.5	
2112	23	Rosaaci	0.25	
2112	23	Rosaaci	0.25	
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2112	24	Poputre	1	
2112	24	Poputre	1	
2112	24	Poputre	7	
2112	25	Poputre	2	
2112	25	Poputre	1	
2112	25	Poputre	3.5	
2112	25	Poputre	1	
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